# MOTORAGE

Vol. XXXIX Number 21 PUBLISHED WEEKLY AT THE MALLERS BUILDING CHICAGO, MAY 26, 1921

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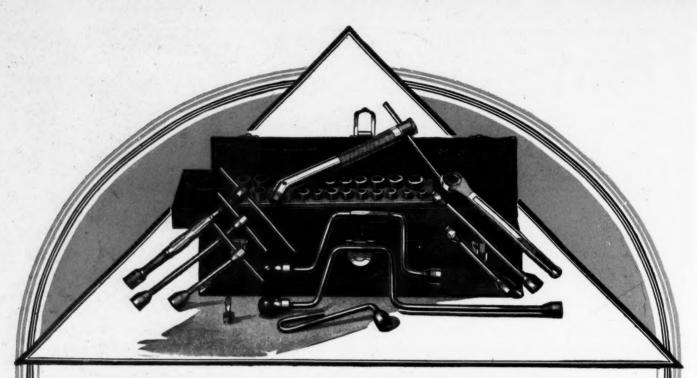
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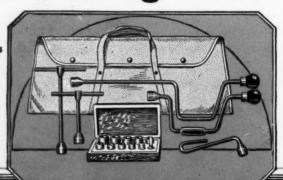
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#### MOTOR AGE

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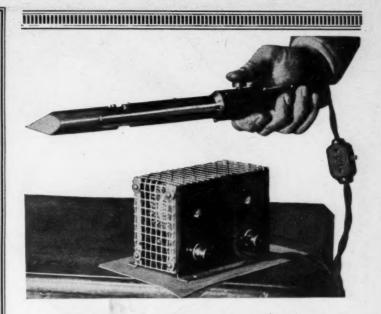
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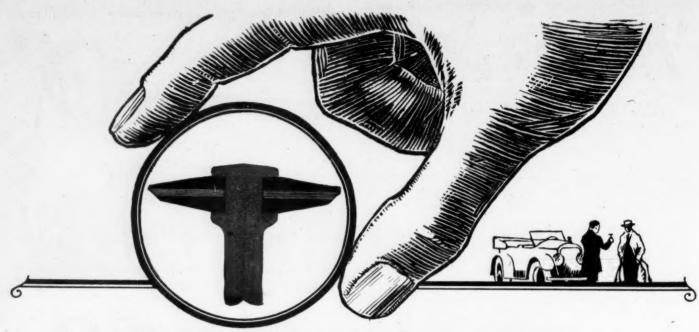
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Mercury, the God of Speed, Will Rule Man's Desires This Year at Indianapolis As in All Time Past

#### By B. M. IKERT

EXT Monday afternoon when the great black embankments of thrilled, cheering people usher in another victor of a 500-mile race on the Indianapolis speedway you stand amazed at this frenzy of a national holiday and, perhaps, ask yourself the reason why. The answer is simple-speed.

Ever since time speed has been with us. The speed god Mercury was worshipped in the days of the Romans when chariots took the place of motor cars.

What if our ancient devotees of speed could return to us and see Tommy Milton hurtle his great 16-cylinder Duesenberg race car to a new world's record of 157 m. p. h? What if they could witness next Monday's struggle on the Hoosier oval between some twenty-five knights of the gasoline circuit?

Speed has been one of the requisites of man since the creation. We have measured it by the sand in the hour glass, the sun-dial, the watch and the delicate chronometer. Some of the most popular people in the history of the world have been the proud possessors of speed records. Man and beast have shared in the glorification of it.

It was speed that rushed Ben Hur into the pages of fiction and gave honor to the runner Pheidippides who carried the news of the Persian defeat on the plains of Marathon to Athens. Speed called the patriots of the American colonies to arms on the night of Paul Revere's famous ride.

In the days of the Egyptians speed was symbolized by the sacred beetle. The Romans looked upon the form of a lithe youth as the personification of speed. To our American Indians speed meant the deer, or the great eagle soaring on high. A few years ago we thought of speed when a steam locomotive shrieked its whistle to let the world know that it was traveling the fastest possible mile. But, to-day when we are living

#### Speeds of Machine, Man and Beast

178 M.P.H.—Airplane—Speed attained by C. C. Mosely of the U. S. Army in the Pulitzer Trophy race flying a Verville plane, November, 1920.

157.09 M.P.H.—Motor Car—Record established by Tommy Milton in a 593.8 cu. in. displacement car at Daytona, Florida, in April, 1920.

123.55 M.P.H.—Electric Trolley—The average speed lade by the electric trolley in a government test over the Berlin-Zossen road in 1902.

120 M.P.H.—Steam Locomotive—The average speed made by a locomotive in a run from Fleming to Jacksonville, Florida, over a five mile stretch in 1911.

111.11 M.P.H.—Motorcycle—Made at Daytona Beach, Florida, in February, 1920, by Leslie Parkhurst, rid-ing a Harley-Davidson machine. One mile in 32.45

sec.

S5.6 M.P.H.—Pigeon—This is the average speed made by a pigeon owned by E. J. Lutz, Buffalo, New York, in a 100-mile flight in 1900.

76.7 M.P.H.—Hydroplane—Made by Miss America, a 26-ft. hydroplane, powered with two Liberty engines driven in a race at Detroit in August, 1920.

72.57 M.P.H.—Cycle Car—The average speed of a Singer car in a one hour time trial held on Brooklyn's race track in England in 1913.

63 M.P.H.—Bieyele—Made by Paul Guignard behind motor pace at Munich, Germany, in one hour time trial in 1909.

42.35 M.P.H.—Running Horse—The average speed made by Bob Wade in a one-quarter mile race at Butte, Montana, August 20, 1890.

38.4 M.P.H.—Motor Boat—The average speed made by Adieu, owned by Webb Jay of Chicago, at Miami, Florida, February, 1921, setting a new world's record for regulation open displacement boats. Time for 50 miles, 1:18.

33.33 M.P.H.—Trotting Horse—Average time made by Uhlan in one-quarter mile race at Lexington, Kentucky, October 2, 1913.

32.72 M.P.H.—Pacing Horse—The average speed made by Dan Patch in one-quarter mile time trial at Memphis, Tennessee, October 27th, 1903.

30.53 M.P.H.—Steamship—The average speed made in the fastest day's run of the Mauretania in June, 1909.

22.03 M.P.H.—Ice Skater—The average speed made by Arthur Staff, Chicago, Illinois, February, 1916. Time for one mile, 2:35.

21.75 M.P.H.—Running Man—The average speed made by R. E. Walker who covered the 100-yd. dash in 9 2/5 sec.

20.44 M.P.H.—Roller Skater—The average speed made by Harry Becker in the 100-yd. race at Chicago, in 1910.

15.75 M.P.H.—Rowing—Made by Edwin Henley at Newark, N. J., in July, 1901, in a one-quarter mile single scull straightaway race.

9.34 M.P.H.—Pedestrian—The average speed made by J. H. Goulding for one mile walk in 6:25 sec., in Canada, June, 1910.

S.3 M.P.H.—Fishing Schooner—Made by Esperanto off the coast of Newfoundland in the fall of 1920. Time for 40 miles, 4:32:30.

4.52 M.P.H.—Swimming—Average speed made by Duke Kahanamoku in swimming 25 yards in 11:3 secs. off San Francisco, August, 1915.

## THE "SHIP OF THE DESERT" HAS THE LONG DISTANCE SPEED RECORD OUR CLIPPER SHIPS-WERE SPEEDY ENOUGH TO RUN THE BRITISH THE PILGRIM FATHERS WEREN'T SO SLOW SOMETIMES ROWING WAS NEVER A VERY SPEEDY OPERATION UNTIL THE RACING SHELL WAS INTRODUCED NATURE NEW YORK TO BOSTON IN FIVE DAYS - HIGH SPEED FOR THEM DAYS

FORMY CHILDREN'S

SAKE I GOTTA SHOW SPEED

NECESSITY WAS ALWAYS THE MOTHER OF SPEED

#### Our Grandfathers Traveled Slow

in an age of stupendous velocities the speed idols of the ancient Romans, the deer and eagle, of the Indian, and the steam locomotive must bow before the rubber-shod steel creation,—the motor car. This is true only if we confined ourselves to the land, because our airplanes have long surpassed the speed records of the motor cars.

In the last 10 years the crown emblematic of pre-eminence in motor car speed has been placed on the heads of five men. Back about in 1910 Arthur Duray drove a 300 hp. Fiat on the smooth beaches of Ostend faster than any car had been driven before, in fact faster than any human being had ever traveled.

About the same time Barney Oldfield and Bob Burman guided the historic Blitzen Benz over the sands of beach at Daytona, Fla., faster than it was dreamed possible for man in machine to endure. Only a short time ago new world speed records were set by Ralph De Palma in a Packard who also chose the sands at Daytona as the scene of his action.

In his trials De Palma drove the kilometer in 14.98 which is at the rate of 150 miles per hour, but, in April of this year Milton smashed to bits all the former marks held by Ralph De Palma in the airplane-engined Packard. Milton drove the kilometer in 14.65 or at an average speed of 157 miles per hour.

#### THE MOTOR CAR BESTS THE STEAM LOCOMOTIVE

At the time when Barney Oldfield achieved the title of speed king, the steam locomotive already had bowed before the motor car, because Marriott had driven a Stanley steamer over 127 miles an hour in 1906. Up to this time the best record held by the steam locomotive was 120 miles per hour, made in 1911 in a run from Fleming to Jacksonville, Fla.

In this connection it is interesting to recall what was said by George M. Sands of the New York Globe at that time. His prediction was this:

"For years the railroad locomotive has stood alone as the maker of the fastest possible mile but, the coming of the motor car has provided a rival which may not improbably succeed at last in reducing the record of even the fastest train. In 1894 such a statement would have been regarded as scarcely worth consideration, for the motor car was so largely an object of experiment that speed was regarded as somewhat of a minor consideration when compared with the infinite details of workmanship on which the successful manipulation of the machine itself depended.

"So far from being a remote possibility, however, the persistent increase in speed of the motor car has brought its record so much nearer that of the locomotive that they now are separated by a small fractional part of a minute and there is no question that under equally favorable circumstances the difference will be partially, if not entirely, obliterated."

Seven years ago in Motor Age the following appeared in the editorial columns: "Just as eight years ago the supremacy of the locomotive was challenged by the motor car so today the latter has a dangerous rival in another mechanical upstart, the airplane, which has an unofficial record of 165 miles an

SINCE THE DAWN

OF TIME THE HORSE HAS BEEN KING hour in a flight with a strong wind behind it. In fact, Duray's Fiat might have to exert itself to defeat the holder of the world's speed record in the air, the biplane in which Maurice Prevost averaged 126.05 miles per hour in the Gordon Bennett cup race in 1913.

"Man, beast, bird and other mechanics, however, have yet to equal, let alone better the official record of the motor car. Match Duray and the Fiat against the swiftest airplane, steam locomotive, electric trolley, steamboat,

#### Steam and Gasoline Now Set Pace

motor-boat, motorcycle, trotter, pacer or running horse against the fastest runner, skater, swimmer or rower and the combination of driver and motor car could give them all a handicap and defeat them in a race of any distance of 100 yards up. This sounds like an extravagant and arrogant claim but compare the speed records and you find it is true."

But since the days when the above was written the motor car has had to bow to the airplane. In the Pulitzer trophy race, C. C. Mosley of the U. S. Army piloted a Verville plane at the astonishing rate of 178 miles per hour.

For the sake of illustration imagine Tommy Milton's Duesenberg pitted against the fastest ocean greyhound, the Mauretania, which established a speed record of 30.53 miles per hour in June, 1909. Such a race would be anything but exciting. Much more exciting would be a match between Miss America, the 26 ft. hydroplane which in a race last August obtained a speed of 76.7 miles per hour.

Still more exciting than a match between the 16-cylinder Duesenberg and some other motor propelled vehicle would be one participated in by Milton and Leslie Parkhurst riding a Harley Davidson motor cycle. Parkhurst was able to guide one of these two wheeled machines over the Florida sands at the rate of 111.11 miles per hour or 32.5 for the mile.

Now supposing we pitted the fast Duesenberg against some of the times made by other holders of records. Uhlan, the king of trotters, with a mile mark of one minute 541/2 seconds and the pacer, Dan Patch, holding the one mile record for the side wheelers, of one minute and 55 seconds or 32.72 miles per hour, certainly would be among the also rans in a race with a gasoline monster. In a match race Milton would lap them about five times and still have yards to spare.

R. E. Walker the sprinter, who covered the one-hundred yard dash in 92-5 seconds would make a poor showing in a contest with the Duesenberg and as we get down the line to the holders of records for roller skating, rowing, walking and swimming, we find that these later would be more hopelessly outclassed. The slowest time made by man is swimming, the average miles per hour being 4.52.

#### THE PROBLEMS OF THE RACE CAR BUILDER

In the struggle for speed a racing car designer and builder must be a fairly good prophet. He must first of all determine about what average speed for the 500 miles on the Hoosier track will be fast enough to win the race.

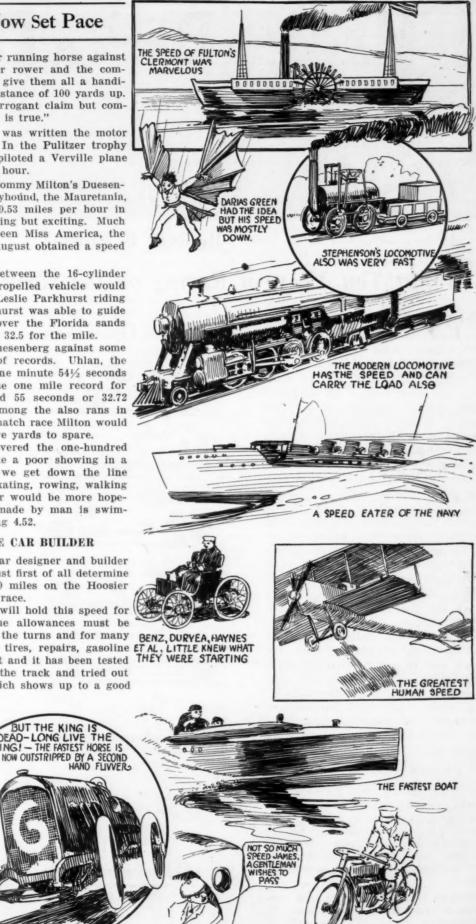
The next job is to build a car that will hold this speed for 200 laps around the brick oval. Due allowances must be made for time lost in slowing down at the turns and for many precious minutes lost at the pits for tires, repairs, gasoline ET AL, LITTLE KNEW WHAT or oil. After the engine has been built and it has been tested THEY WERE STARTING on a dynamometer it must be put on the track and tried out for the desired speed. An engine which shows up to a good

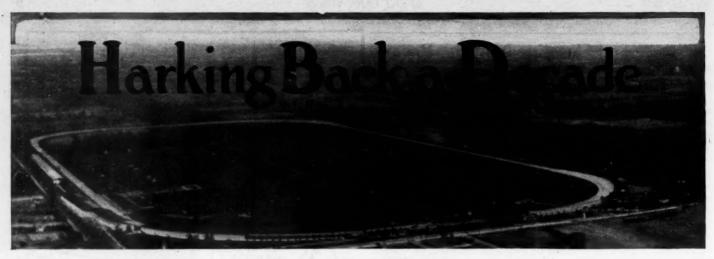
BUT THE KING IS

advantage on a dynamometer or in the laboratory may show up some big faults when placed in a car and driven at speed on the track.

Sometimes such an engine will develop what the designers call "a critical" and a great deal of calculations and experimenting must be done to get rid of the "critical," especially if it comes at the speed on which the designer has figured to win. Briefly a "critical" is a period of vibration which may result in disaster if something is not done to overcome it.

(Concluded on page 15)





By ROY E. BERG

#### What Ten Years of Racing on the Hoosier Oval Recall

URING ten years of racing on the Indianapolis course there has been constant battling by science against the forces of nature. Man has evolved cunning machines capable of sustained high speeds, machines that travel farther at these high speeds than the most highly perfected locomotives. During the years from 1911 to now, the Indianapolis track has become a factor in the lives of racing men. To have won a race on this track places the name of the winner in the archives of the racing world.

No man has yet won the Memorial 'day event twice; there have been eight races, this year being the ninth in ten years of racing on the track, and there have been eight different winners. Many of the racing stars of old are still pushing their fire spitting chariots around the track and in one or two instances drivers who started in the first race ever held on the track are still plying their trade and furthermore some of these drivers have entered and driven in every race held since the first.

#### A LABORATORY OF SCIENCE

The Indianapolis track has become of international importance to the automotive world. Every country of any importance in automotive manufacturing has at one time or another been represented by speed cars. Drivers from the world over have been at the track to pilot the cars.

Science in all its cunning has contrived to array all its forces against the Indianapolis track. The laboratory of the metallurgist has produced steels and light weight alloys capable of with stand-

Cars That Have Won

ing terrifific strains from the impact of the road. High speed engines have been designed by the engineer and the power developed by these engines is remarkable for the size of the engine. All this development has not been done overnight, however.

Gradually through the slow process of evolution these engines and designs have been created, and each design has been based on the success and experience of the preceding. Strict comparison of these race cars from year to year reveals little difference but when compared over a decade it is easy to see why the cars are doing what was expected of them.

Reviewing the events of the races since 1911 we find many thrilling incidents. The uncertain is always happening in these big races, and in the first race, after 400 miles had been covered, the lead position was still in the balance, hanging to either of four contending Harroun, Mulford, Bruce-Brown, Wishart, and De Palma. Harroun was driving a big yellow Marmon having a bore and stroke of 4½ by 5 inches with six cylinders.

The wheelbase of the car was 116 inches, which is quite different from that on the winning car last year, 96 inches. Harroun's lead after 450 miles was by a small margin. A tire change would have put him in second or third position. In the very few remaining laps of the race these four contenders holding the first four places were positioned in the same lap. The average speed of the winner was 74.7 m. p. h. It will be noted that the piston displacement of these cars was 476 cubic inches.

#### LOSES ON LAST LAP

The second race, held in 1912, was won by Dawson driving a National covering the 500 miles at an average speed of 78.7 m. p. h.. The National had a four cylinder engine with a bore and stroke of 5 by 61/4 and a piston displacement of 490.8 cubic inches. This is the race that De Palma was voted the hard luck crown

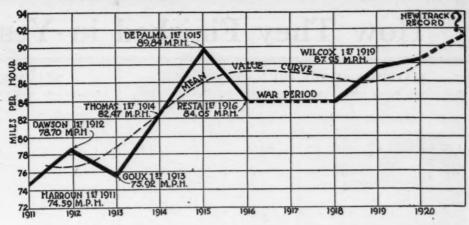
by universal acclamation. De Palma had the race cinched at 495 miles. With two and one-half laps to go one of the pistons of De Palma's Mercedes broke and victory was snatched from the Italian driver.

Ninety thousand people saw De Palma push his car in for the last lap. During 495 miles of travel De Palma had held first place and had broken all track records. Teddy Tetzlaff, driving a Fiat, drove in for second place at an average of 76.6 m. p. h. Hughes, in a Mercer, finished third at an average of 76.3 m. p. h. and Merz, in a Stutz, finished fourth averaging 76 m. p. h.

The victory in the third race fell to M. Jules Goux who spurred his car on to faster and faster speed through the use of high grade gasoline, castor oil and champagne. It is said that Goux consumed seven pints of champagne during the race and it was to this stimulant that Goux attributed his victory. From the 330 mile lap on, Goux assumed the lead and held it to the finish. The speed of the winner was 75. m. p. h., and the car was a Peugeot. Second position went to Wishart, driving a Mercer, averaging 73.92 m. p. h. Wishart had fought a steady battle all through the race. His position in the early part was very low and he was never regarded as a contender until after 300 miles of travel. His pace steadily increased and only twice during the whole race did he relinquish any gain he had made. These loses were minor and were caused by stoppage for gasoline and tires. (Had Wishart been able to start off at a better rate and maintain his same relative position that he assumed in reality, he would have won. But this is one of those "ifs" and "would have beens" and is, therefore, another story.)

Up to this time the American built cars had been the winners on the track but in the race of 1913, the car driven under the Tri-color of France carried away the laurels.

The next year, 1914, saw another French car win the race, this one being a Delage driven by the old veteran Rene Thomas. Also, much to the humility of the American built cars the foreign makes captured second, third, fourth, sixth and



Average speeds made during each race held on the Indianapolis track are shown in the above chart. It will be noted that Ralph DePalma holds the track record. It is confidently expected by all racing experts that this year will see a new record for the 500 miles established. The mean value of speeds is shown by the dotted lines. The new track record which if made this year is shown at 91 M.P.H., which is based on a calculation considering the speeds and designs of this year's entrants

seventh places; seventh place being won by the Sunbeam driven by an American. This year saw the track record of 78.7 m.p.h., made by Dawson in the National in 1912, broken. The methodical Thomas driving a very conservative race brought in the bacon at 82.47 m. p. h.

#### PREDICTS WINNING SPEED

Before the race started Thomas said, in his quiet manner, that he would average 83 m. p. h. His victory was six laps ahead of second place made by Duray in his Pugeot at 80.99 m. p. h. Albert Guyot in a Delage made third place at 80.2 m. p. h. and Goux, winner of the previous race, came in fourth averaging 79.41 m. p. h. Luck seemed to be favoring everyone on the day of this race.

Charles Sedwick, who directed the race, rolled out of his hammock early Monday morning and, upon walking over the track, picked up a horseshoe and thereupon declared that the track record would be broken, and it was. Up to this time there had been no limitations placed on piston displacement of the cars and 1915 saw the introduction of a ruling limiting displacement to 300 cu. in. The smaller cars of 1915 were not only faster but seemed to perform with much greater regularity. Ralph De Palma who, up

to this time, had been a serious contender in all races and who, three years before, had been a hero in defeat, won the race. Again the track record was shattered. Driving the 500 miles at an average speed of 89.84 m. p. h. it is interesting to note, in this connection, that Ralph De Palma's track record still stands.

In this race De Palma almost outran his jinx. In the race of 1912 when Ralph covered 495 miles it will be recalled that the Italian's mount balked by blowing in a piston head. The race of 1915 which he won at the record breaking speed almost duplicated the heartbreaking defeat formerly experienced by this favorite of the track. De Palma had five miles to go when a connecting rod broke and punched a hole in the crank case.

The remaining miles were covered on three cylinders and as the checkered flag was waved over his head the last drop of oil poured out from the crank case. The next three drivers, Resta in a Peugeot, averaging 88.91 m. p. h., Anderson in a Stutz, averaging 87.60 m. p. h., and Earl Cooper in a Stutz, averaging 87.11 m. p. h. broke the track record of the previous year.

It was this race that witnessed the fighting of the battle between the two

#### These Men Have Been First to Get the Checkered Flag



#### How They Finished in Years Gone By

#### STATISTICS OF THE 1911 500-MILE RACE

Open to cars with a piston displacement of 600 cubic inches or under.

Po	s. No	). Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	32	Marmon, Harroun	6	4 1/2	5	447.1	6:42:08	74.59
2	33	Lozier, Mulford	4	5 3/6	6	544.6	6:43:51	74.29
3	28	Fiat, Bruce-Brown	4	5	7 1/2	589.0	6:52:29	72.73
4	11	Mercedes, Wishart	5	5.1	7.1	580.2	6:52:57	72.65
5	31	Marmon, Dawson	4	4.5	7 ½ 7.1		6:54:34	
6	2	Simplex, R. de Palma	4	5 3/4	5 %		7:62:02	
7	20	National, Merz	4	5	5 11/16	436.8	7:06:20	
8	12	Amplex, Turner	4	5 5/16	5		7:15:56	
9		Knox, Belcher		5	4 3/4 5 1/2 5 1/2	559.1	7:17:09	68.62
10		Jackson, Cobe		5	5 1/2		7:21:50	
11	10	Stutz, Anderson	4	4 3/4	5 1/2		7:22:55	
12		Mercer, Hughes		4 3/8	5		7:23:32	

#### STATISTICS OF THE 1915 500-MILE RACE

Open to cars with piston displacement of 300 cubic inches or under.

						-		
Pos	. No	c. Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M.P. H.
1	2	Mercedes, R. de Palma	4	3.620	6.500	274.0	5:33:55.51	89.84
2		Peugeot, Resta						
2 3		Stutz. Anderson						
4	4	Stutz, E. Cooper	4	3.800	6.480	295.3	5:46:19.36	87.11
5	15	Duesenberg, O'Donnell	4	3.980	6.000	299.0	6:08:13.27	81.47
6		Peugeot, Burman						
7		Stutz, Wilcox						
8	10	Duesenberg, Alley	4	3.980	6.000	299.0	6:15:08.01	79.97
9	19	Maxwell, Carlson-						
		Hughes						
10	7	Sunbeam, von Raalte	4	3.700	6.300	274.0	6:35:23.43	75.79

#### STATISTICS OF THE 1912 500-MILE RACE

Open to cars with a piston displacement of 600 cubic inches or under.

Pos	. No	car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	8	National, Dawson	4	5	6 1/4	490.8	6:21:06	78.7
2		Fiat, Tetzlaff		5	7 1/2	589.0	6:39:25	76.6
3	21	Mercer, Hughes	4	4 3/8	5	300.7	6:33:09	76.3
4	20	Stutz, Merz	4	4 3/4	5 1/2	389.9	6:34:40	76.0
5	18	Schacht, W. Endicott	4	4 3/4	5 1/2	389.9	6:46:28	73.3
6	2	Stutz, Zengel	4	4 3/6	5 1/2	389.9	6:48:31	73.2
7	14	White, Jenkins	6	4 1/4	5 %	489.4	6:52:38	72.7
8	22	Lozier, Horan	4	5 3%	6	544.6	6:59:38	71.4
9		National, Wilcox		5	7 1/2	589.0	7:11:30	69.6
		Knox, Mulford		4.8	5 1/2	597.16	8:53:00	56.2

#### STATISTICS OF THE 1916 300-MILE RACE

(300 miles, limited to cars of 300 cubic inches piston displacement.)

Pos. No. Car and driver	Cylinder	Bore	Stroke	Piston displace,	Time	М. Р. Н.
1 17 Peugeot, Resta	4	3.6	6.6	274	3:34:17.51	84.05
2 1 Duesenberg, D'Alene	4	3.75	6.75	298.2	3:36:15.28	83.25
3 10 Peugeot, Mulford	4	3.6	6.6	274	3:37:56.20	82.65
4 14 Sunbeam, Christiaens	4	3.21	6.14	294	3:46:36.03	79.45
5 15 Delage, Cldfield	4	3.70	6.30		3:47:19.63	
6 4 Maxwell, Henderson					3:49:56.48	
7 29 Premier, Wilcox	4	3.66	6.25	278.8	3:54:31.31	76.85
8 26 Crawford, Johnson	4	3.76	6.75		4:01:54.75	
9 24 Crawford, Chandler	4	3.76	6.75	298.8	4:02:42.38	74.05
10 9 Osteweg, Haibe	4	4.34	5.00	296.4	4:03:10.51	73.85
11 12 Ogren, Alley	4	3.75	6.75	298.2	4:04:47.10	73.60

#### STATISTICS OF THE 1913 500-MILE RACE

Open to cars with a piston displacement of 450 cubic inches or under.

Pos	. No	c. Car and driver	Cylinder	Воге	Stroke	Piston displace.	Time	М. Р. Н.
1	16	Peugeot. Goux	4	4.246	7.875	448.13	6:35:05:00	76.92
2		Mercer, Wishart						
3	2	Stutz, Merz						73.38
4	9	Sunbeam, Guyot						
5		Mercedes-Knight.						
		Pilette	4	3.937	5.118	251.33	7:20:13:00	68.14
6	12	Gray Fox, Wilcox	4	4.750	5.500	389.90	7:23:26:55	67.65
7		Mercedes, Mulford						
8	31	Case, Disbrow	4	5.100	5.500	449.00	7:29:09:00	63.08
9	35	Mason, Haupt	4	4.316	6.000	350.50	7:52:35:10	63.47
10	25	Tulsa, Clark	4	4.752	5.500	340.10	7:56:14:25	62.99

#### STATISTICS OF THE 1919 500-MILE RACE

Open to cars with piston displacement of 300 cubic inches or under.

Pos	. No	o. Car and driver	Bore	Stroke	Piston displace.	Time	М. Р. Н.
1	3	Peugeot, Wilcox 4	3.6	6.7	274.6	5:40:42.87	87.95
2	14	Durant, Hearne 4	3.81	6.5	298.6	5:44:29.04	87.00
3	6	Peugeot, Goux 4	3.6	6.7	274.6	5:49:06.18	85.20
4	32	Ballot, Guyot 8	2.9	5.5	296		
5	26	Bender, Alley 4	3.62		289		
6	4	Packard, De Palma12			299.2		
7	7	Frontenac, L. Chevrolet 4	3.87	6.37	299		
8	27	Hudson, Vail 6			288.6		
	41	Frontenac, G. Chevrolet 4		6.37	299		
10	31	Ballot, Thomas 8		5.5	296		
11	8	Stutz, Cooper 4	3.81	6.5	298	6:21:35.05	78.60

#### STATISTICS OF THE 1914 500-MILE RACE

Open to cars with a piston displacement of 450 cubic inches or under.

Pos. No. Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1 16 Delage, Thomas 2 14 Peugeot, Duray 3 10 Delage, Guyot 4 6 Peugeot, Goux 5 3 Stutz, Oldfield 6 9 Excelsior, Christiaens 7 27 Sunbeam, Grant 8 5 Beaver-Bullet, Keene 9 25 Maxwell, Carlson 10 42 Duesenberg, Rickenbacker	4 4 4 6 6 4 4	3.07 4.13 3.94 4.80 3.80 3.14 5.10 4.20	6.18 $7.08$ $7.08$ $6.00$ $6.20$ $5.90$ $5.50$ $8.00$	183.0 380.2 345.0 434.3 446.6 273.0 449.4 445.3	6:14:01 6:17:24 6:23:51 6:27:24 6:36:22 6:40:57 7:02:42	80.20 79.41 78.15 77.44 75.69 74.82 70.96

#### STATISTICS OF THE 1920 500-MILE RACE

Open to cars with piston displacement of 183 cubic inches or under.

Pos.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	М. Р. Н.
2 Ba 3 Du 4 Du 5 Ba 6 Du 7 Ba 8 Mo 9 Sp	onroe, Gaston Chevrolet llot, Rene Thomas esenberg, T. Milton llot, Ralph De Palma esenberg, Eddie Hearne llot, Jean Chassagne nroe, Joe Thomas ecial, Ralph Mulford	88888848	2.56 2.5 2.56 2.56 2.56 3 1/8 2.5	$\begin{array}{c} 5\ 15/16 \\ 4.41 \\ 4.625 \\ 4.625 \\ 4.41 \\ 4.625 \\ 4.41 \\ 5\ 15/16 \\ 4.625 \end{array}$	182.5 181.6 181.5 181.5 181.6 181.6 182.5 181.5	5:43:02.29 5:46:43.38 5:52:31.37 6:05:19.15 6:14:19.16 6:15:15.68 6:21:41.55	87.47 $86.52$ $85.10$ $82.12$ $80.15$ $79.94$ $78.60$ $68.33$

Italians, Resta and De Palma. De Palma aggressively planned his attack and at the end of 300 miles the jinx artist changed four tires and took on gasoline and oil. By so doing the lead of the race was lost but only momentarily. Two minutes and twenty-one seconds were consumed in making the tire change and provisioning. That the move was well planned was proved by the fact that seventeen laps later Resta was forced to the pits for a rear tire and a few minor adjustments.

De Palma had calculated that his pre-

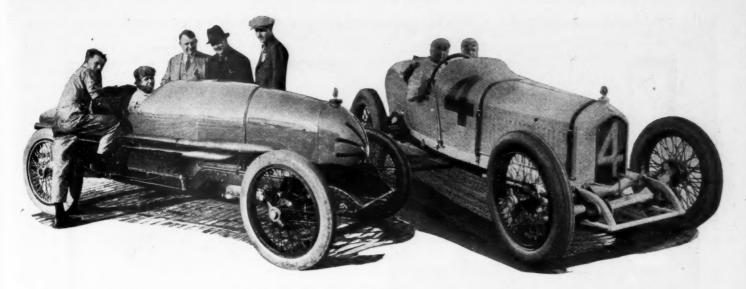
cautionary changes would be the last stop for the 500 miles. Up to this time De Palma and Resta had fought a closely contested dual for but twenty seconds separated the drivers at 250 miles. Three hundred cubic inches was the displacement of the fast engines of 1915 but this limited size proved to be an increment rather than a detriment in speed.

#### NOT CLOSELY CONTESTED

Resta who lost the 1915 race to De Palma won the 1916 race, not by any great display of speed but by a consistent display of endurance. His speed for the 300 miles was 84.05 m. p. h. There was very little excitement in this race. Resta simply took the lead at the fortyfifth mile and held it until the end of the race. He was trailed alternately from there on by Louis Chevrolet in a new and untried Frontenac, D'Alene in a year old Duesenberg and Johnny Aiken in a Peu-

Nineteen-nineteen, the race which Howard Wilcox won driving a Peugeot, averaging 87.95 m. p. h., was the last

(Concluded on page 15)



Two of the most formidable drivers and cars which will line up for the start May 30 at Indianapolis for the 500 mile race. Milton, at the left, in the new Frontenac-eight and De Palma in the Ballot with which he won the Elgin road race last fall and with which he lead the field at the Indianapolis last year for a long time only to lose out near the end of the race by engine trouble

## The Lineup for 1921

Annual 500-Mile Speed Classic at Indianapolis, May 30, Has Greatest List of Star Performers Ever to Face Starter—Expect to Break Records

#### Speedway, Indianapolis, May 24, Special Wire

THIS year's Indianapolis race promises to be the greatest in the history of the Speedway, and will be a three cornered fight for supremacy in the perfection of design of the light racing car between England, France and America.

The lap prize money has been increased to two hundred dollars a lap and will result in forcing the drivers to set a fast pace. For the first time the drivers will stage a carnival for the benefit of the public a week before the race. This carnival will be leatured by exhibition driving and Wallace Reid, the moving picture star, will perform with Roscoe Sarles, who is driving one of the Duesenbergs.

A year ago the little racing cars made their initial appearance and although they performed in wonderful style, they were untried. The engineers and drivers have taken advantage of the experience gained by campaigning the cars through last year's racing season, and today it is the question of perfection that

will designate the winning car. All efforts have been extended in getting every possible ounce of speed. Many of the cars that competed a year ago will enter this year's race

#### Official Entry List for 500-Mile Race

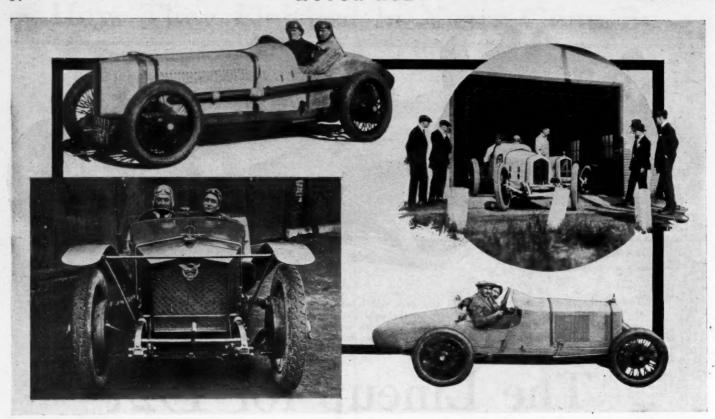
Driver		Car
Eddie Hearne	Revere	Special
Ralph De Palma	Ballot	Special
Ira Vail	Leach	Special
James Murphy	Duesenberg	Special
Roscoe Sarles	Duesenberg	Special
Edward Miller	Duesenberg	Special
Eddie Pullen	Duesenberg	Special
Ralph Mulford	Frontenac	Special
Tommy Milton	Frontenac	Special
Howard Wilcox	Peugeot	Special
Andre Boillot	Talbot-	Darracq
Rene Thomas	S	unbeam
Dario Resta	S	unbeam
Joe Thomas	Junior	Special
R. J. Brett		
Percy FordCh	icago Fronte	nac Sp.
Joe Boyer	Duesenberg	Special
Albert Guyot	Duesenberg	Special
C. W. Van Ranst	Frontenac	Special
L. L. Corum	Frontenac	Special
M. E. Headley		
Bennett Hill	Due	senberg
Jean Chassagne	Peugeot	Special
Jules Ellingboe	Frontenac	Special

without any material changes, but, so far, greater speed is being obtained and the performance exceeds that of any previous time.

#### DE PALMA WORKING HARD

France will be represented by the Puegeot team, Wilcox and Chassagne. The new Peugeots have much the appearance of the 1914 Puegot and are of practically the same design excepting that ball bearings are used for the connecting rods in place of plain bearings. The valve action is the same as that used in De Palma's Ballot, Ralph De Palma will pilot the Ballot which is identically the same as it was a year ago. He has been on the track every afternoon and has turned several laps at better than a hundred miles per hour.

America will be represented by two famous racing teams comprising six Duesenberg Straight-Eight Specials, five Frontenac Specials, which are identically the same as they were a year ago, two Frontenac-Eight Specials of new design, two Junior Specials, and a few individual entries, the Revere Special, the Leach Special and one of the old Duesenberg Specials. The Duesenberg cars which have been entered by the Duesenberg brothers comprise four cars of practically the same design with a few slight changes. In the old jobs the transmission was located in unit with



Europe's best speed creations are going to combine to give our American cars and drivers the battle of their lives. At the top, left, is Major Seagrave in the eight-cylinder Sunbeam. Below him is Albert Guyot in the Bignan Sport with which he recently won the Corsican Grand Prix. Guyot, however, will pilot a Duesenberg at Indianapolis this year. Top, right, De Palma's Ballot coming out on the track for a trial spin. Below is Chassagne in the fleet Puegeot. It will be recalled that the Puegeots have won the Hoosier classic three times, the drivers being Goux, Resta and Wilcox

the rear axle, but it is now located amidships. The two new Duesenbergs which have just arrived from the factory, and which will also compete in the French Grand Prix, have the frame centered, and are equipped with four wheel hydraulic brakes. Probabilities are that the front wheel brakes will not be used in this race. A one plate disk clutch designed by Duesenberg is employed and a Miller transmission has been adopted. Albert Guyot will drive one of the Duesenbergs. This is apparently the first time any foreign driver has taken an American mount.

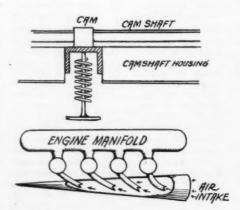
#### SUNBEAMS DEFEND ENGLAND

The Frontenac four cylinder entries are identically the same as they were a year ago but are showing much better speed. They are the only four cylinder cars entered and the entry list seems to indicate that the tendency in design is leaning toward the eight-inline type. The new Frontenac eights are causing a great deal of comment and have proved extremely fast. Previous to this time Louis Chevrolet has always built four cylinder racing cars, but his new achievement is an indication that he believes better performance can be obtained from the eight cylinder engines. Tommy Milton and Ralph Mulford will pilot the two cars and indications are that it will take "some stepping" to beat them.

The Junior specials designed by C. L. Richards, were built in a private garage in Kansas City. The engines are six

cylinder, cast en bloc and have turned up as high as 5300 revolutions per minute. The cars are very light, weighing only 1770 lbs. and the bodies are very narrow being but 26 in. at the widest place.

England will be represented by two Sunbeams driven by Dario Resta and Rene Thomas, and the Talbot-Darracq Special driven by Andre Boillot. The Talbot-Darracq is the same as the Sunbeams. The engine has two blocks of four cylinders each of cast aluminum. The cylinders have low carbon steel



Two Sunbeam features. Top, the valve layout, showing the cam which bears directly on the sleeve actuating the valve. Below, manner of scooping the air into the four Claudel carbureters

sleeves which are shrunk into the aluminum block. The engine and transmission is mounted on a sub frame which is suspended at three points with three universal joints.

The frame is off-set about 3 in. The intake valves have a concave surface and the exhaust valves are flat. The valve action is identical with that used in the Ballot, the Peugeot and the Frontenac Eights. A sleeve is employed which operates in the camshaft housing and is actuated by a cam located directly above this sleeve. Apparently this type of valve action has been taken from the Ballot car.

The factor which seems to predominate thus far is the effort on the part of drivers and mechanics to get every possible ounce of speed out of their cars. The little racing car has proven a success and it is simply a wreath of perfection that will crown the nation that furnishes the winning car. The Sunbeams are using a type of carburetion which has been common in European aviation practice. Four Claudel carbureters are used and the air is forced through a funnel shaped pipe incorporated in the engine hood. Very good results are being obtained as the cars have been on the track making better than 95 miles per hour. From the number of American cars entered it seems as though America ought to win by mere force of numbers.

Most of the drivers have decided what equipment will be used, but a great deal of tuning up is being done to obtain the relative speed possibilities of the cars. The track is not in the best of condition and so far two slight accidents have occurred. Harry Stutz driving one of his H.C.S. cars will be pacemaker at this year's race.

The list of drivers this year represents the master drivers of the world and the entrance of Resta who has not made an appearance on the Indianapolis track for five years makes the competition keener.

#### HARKING BACK A DECADE

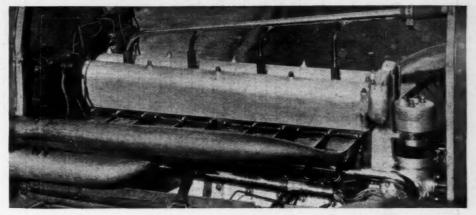
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race for 300 cu. in. cars. It was decided, after this race was over that 300 cu. in. cars had been developed to the highest point of efficiency and that if any great strides were to be made in automotive engineering, they would have to come through reducing the size of the engine and by clever designing, to increase their efficiency. Eddie Hearn won second place driving a Durant Special and the veteran, Jules Goux, rolled in for third.

De Palma, in this race, led the field for the first 150 miles at the end of which time his average was better than 92 m. p. h. After a short stop for minor adjustments during which time Louis Chevrolet took first place, the Italian came back and hopped the pace up to 91.6 m. p. h. from 90 m. p. h. which Chevrolet had been maintaining. De Palma to-day holds the 100 mile record as well as the track record.

#### MANY DEATHS IN WAKE

A number of men were killed during this race and it is said that this was the bloodiest affair ever held on the famous oval. The Roamer car, driven by Le Cocq, entering the backstretch on its ninety-sixth lap blew a tire, skidded and the tail piece of the car scraped along the inner wall. The gas tank was torn open, the car swerved from its course and overturned, gasoline spreading over the hot exhaust pipe, igniting, and the



Exhaust side of the new Frontenace eights to be driven by Milton and Mulford Note the Delco generator at the forward end which supplies current for battery ignition

driver, with his mechanician, was killed instantly.

Arthur Thurman, said to be a lawyer from Washington, D. C., driving his own car, had an accident after having traveled 110 miles. The car overturned and in the resulting crash against the wall, Thurman was killed. The fourth man to be killed died as a result of a break in the timing wire occasioned by Louis Chevrolet's car driving across the wire with a broken rear wheel, the brakedrum of which severed the wire. Shannon imfollowing Chevrolet was mediately caught in the snarls of the spring steel wire, as he passed by, the wire's end cutting him near the jugular vein. There were 106 pit stops in this race which fact is interesting to compare with the record of the succeeding race.

In following the course of events on the Indianapolis track we have seen that the first two races were won by American built cars. Up to and including 1919, since the first two races were held, not an American car had come in first, but in 1920, the European precedent was shattered by the victory of Gaston Chevrolet driving a Monroe car.

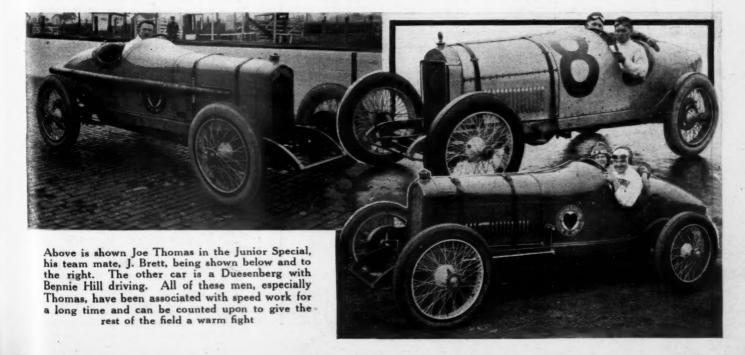
This year also saw the entry of the small car having a displacement of 183 cu. in. The average speed of the winner was 88.16 m. p. h. which was faster than the preceding year when cars of almost twice the displacement were run. René Thomas who won the fourth race held on the track secured second place in his Ballot and Tommy Milton drove in for third place averaging 86.52 m.p.h. It was this race that proved conclusively the ability of the small engine to attain great speeds.

#### EVERYTHING FOR SPEED

(Concluded from page 9)

For example, a designer may have decided that a car driven at 100 miles per hour with an engine speed of 3,400 r. p. m. is about right to win the race, yet it may develop that at this speed and at this engine r.p.m. there is great vibration of the engine, frame, etc.

Sometimes it is possible to overcome this by running the engine a little slower or a little faster. Sometimes it means better balancing of the crankshaft, flywheel, clutch or any other rotating parts,



# Indianapolis 500 Mile Race, May 30, 1921 echnical Specifications of Cars Entered in

	2.	CYLINDERS	DERS		-		VALVES	Care		Goar		Tipo		10	-		6		
CAR	No. DRIVER	No. Cast	Ar- range- ment	Bore and Stroke Piston No.	Piston Dis.	No. Loc.	Operation	Ign. bure-	Base		Tire and Size	Make Wh	Wheels Plugs		Absorb- Meter	er Clutch	Trans- mission	Brakes	West
Frontenac Sp	Frontenac Sp Tommy Milton	8 Block	Line	25/x47/g	182.5	32 Head 2	2 Ov'h'd Shafts   Delco   Miller	Delco Miller	r 102.	314-1		Oldfield R.W.	V. Champion	on Hartf'd	f'd Yes	Single Disk			1850
Frontenac Sp.	routenac Sp   Ralph Mulford   8   Block	8  Block	Line		182.5	32   Head   2	2 Ov'h'd Shafts   Delco   Miller	Delco Mille	r 102.	3/4-1	*************	. Oldfield R.W.	V.  Champion	-	1				-
Frongense Sp.	rongenac Sp   C.W. van kanst	4 Block	Line	31/8x515/16	182.5	16 Head   2	2 Ov'h'd Shafts   Delco   Miller	Delco   Miller	r   98.	3.12-1	32x41/2-R & 32x4-F	Oldfield R.W.	1	-	1	-			-
Frontenac Sp.	rontenac Sp   L. L. Corum	4  Block	Line	31/8x515/16	182.5	16   Head   2	2 Ov'h'd Shafts   Delco   Miller	Delco   Miller	r   98.	3.12-1	32x41/2-R & 32x4-F 9 Oldfield   R.W.	JOIdfield   R.V.		on Hartf'd		1			-
Frontenac Sp   M.E. Headly	M.E. Headly	4 Block	Line	31/8x515/k	182.5	16   Head   2 (	2 Ov'h'd Shafts   Delco   Miller	Delco Miller	r   98.	3.12-1	32x41/9-R & 32x4-F	Oldfield R.W	-		f'd   Yes	Disk			
Frontenac	rontenac Jules Ellingboe.   4	4 Block	Line	31/8x516/k	182.5	16   Head   2	Ov'h'd Shafts	Delco   Miller	r   98.	3.12-1	32x41/9-R & 32x4-F	Oldfield R.W	V  Champion	on Hartf'd	f'd   Yes	Disk			-
ChiFrontenac-Sp.	hiFrontenac-Sp.     Percy Ford   4   Block	4  Block	Line	3/8x515/6	182.5	16   Head   20	2 Ov'h'd Shafts   Delco   Miller	Delco Miller	r   98.	3.12-1	3.12-1  32x41/2-R & 32x4-F	Oldfield R.W.	1	Hartf'd		1 Plate Deus'b'g	-		
Duesenberg Sp	Juesenberg Sp   James Murphy.   8   Block	8 Block	Line	21,6x45,0	181.	24 Head 1	Ov'h'd Shaft	Delco   Miller   105.	. 105.	3.465-1	3.465-1 32x41/2-F & 33x5-R	Oldfield R.W.	V. IA. C.	Hartf'd	f'd   Yes	Disk Brown	-		2000
Duesenberg Sp	Juesenberg Sp   Roscoe Sarles	8 Block	Line	21/5x4% 1	181.	24 Head	-	Delco   Miller	104	3.465-1	3.465-1   32x41/2-F & 33x5-R	Oldfield R.W.	V. IA. C.	Hartfd	r'd   Yes	11 Plate Dues'b'g	3,p,z		1
Duesenberg Sp	Juesenberg Sp   Edw. Pullen	8 Block	Line	21/5x4%	181.	24 Head 1	24 Head   1 Ov'h'd Shaft	Delco   Miller	105.	3.465-1	3.465-1 32x41/2-F & 33x5-R	Oldfield R.W.	7. IA. C.	Hartfd	1	Disk Brown.			0006
Duesenberg Sp	Juesenberg Sp   Edw. Miller	8 Block	Line	21/5x45/6	181.	24 Head 1	24 Head   1 Ov'h'd Shaft	Delco Miller	104	3.465-1	3.465-1   32x41/2-F & 33x5-R	Oldfield R.W.		Hartf'd		Disk Brown	Disk Brown-Line		
Duesenberg Sp	Juesenberg Sp   Joe Boyer	8 Block	Line	21/5x45/8	181.	24 Head 1	24 Head   I Ov'h'd Shaft '	Delco   Miller	104.	3.465-1	3.465-1 32x41/2-F & 33x5-R	Oldfield R.W.	7. A. C.	Hartf'd		Oisk Brown-Line	-Lipe		-
Duesenberg Sp	Juesenberg Sp [ Albert Guvot   8	8 Block	Line	23/5x45/6	181.	24 Head   1	24   Head   I Ov'h'd Shaft	Delco   Miller	104	3.465-1	3.465-1   32x41/2-F & 33x5-R	Oldfield R.W.	7.  A. C	Hartfd	d   Yes	Cone			-
Duesenberg Ep	Jucosphe g Sp Bennet Hill   8 Block   Line	8 Block	Line	23/2x45/8	181.	16 Head 1	16 Head   I Ov'h'd Shaft	Delco   Miller	106.5	31/4-1	32x41/2-F & 33x5-R	Oldfield   R.W		A.C.orK.L.G. Hartf'd	'd   Yes	Disk			-
Sunbeam Sp Rene Thomas.	Rene Thomas	8  2Blocks  Line	s Line	65x112-2.56x4.41 181.6	-	32   Head   2	32 Head 2 Ov'h'd Shafts	Delco Cl'd'I	3.5-1		32x41/2-F & 33x5-R	Oldfield R.W.	-	A.C.orK.L.G. Hartf'd	d   Yes	Disk			210 0
Sunbeam Sp   Dario Resta   8   2 Blocks   Line	Dario Resta	8 2Block		65x112-2.56x4.41   181.6   32   Head   2 Ov'h'd Shafts   Delco   Cl'd'l	81.6	32 Head 2	Ov'h'd Shafts	Delco Cl'd'I	3.5-1		32x41/2-F & 33x5-R	Oldfield R.W.		A.C.orK.L.G.  Hartf'd	a   Yes	Disk			inne
Talbot-Darraed Sp.	albot-Darracq Sp Andre Boillot	8 2 Blocks Line		65v11256-4.41 181.6		32   Head   2	32   Head   2 Ov'h'd Shafts   Delco   Cl'd'l	Delco Cl'd'I	1	3.5-1	32x41/2-F & 33x5-R	Oldfield R.W.		Yes	Yes	Cone			-
Peugeot Sp	Howard Willeox	4 Block	Line	3.35xo.11	181.	16 Head  2	16 Head   2 Ov'h'd Shafts   Delco   Miller	Delco   Miller	- 105.		R.W.	IR.W		Yes	Yes	Cone			-
Peugeot Sp.	Seugeot Sp Jean Chassagne   4   Block	4 Block	Line	3,35x5,11	181.	16   Head   2	16 Head   2 Ov'h'd Shafts   Delco   Miller	Delco   Miller	105			R.W.		Hartid	d   Yes	Disk	Miller	Four Wheel	-
unior Sp.	unior Sp R. J. Brett	6 Block. Line		28/x5	179.	24 Head   2	24 Head   2 Ov'h'd Shafts   Delco   Miller	Delco Miller	103		32x41/2-F & 33x5-R	R.W.	A. C.	Hartf'd	'd   Yes	Disk	Millor	Four Wheel	1770 leel
Junior Sp Joe ' homas 1 6   Block	Joe 't homas	6 iBlock		236v5	1174.	24 Head 2	24 Head   2 Ov'h'd Shafts   Delco   Miller	Delco   Miller	103.	********	32x41/2-F & 33x5-R	R.W.	7.  A. C.	Harif'd	ea Yes	Dry Plane	Brown-Line	-	-
Revere Sp.   Eddie Hearne   8   Block   Line	Eddie Hearne	8 Block		216x456	181	24 Head 1	24   Head   1 Ov'h'd Shaft   Delco   Miller	Delco   Miller	9.901		32x416-F & 33x5-R	R.W	/ K L. G.		Yes				
Ballot Sp Rainh OePalma   R   Hinck	Ralph OePalma	8   Block	Line	2.56v4 1 1	1×1.6	32 Head  20	by'h'd Shafts	104.5	. 104.5		32x41/2	R.W.	1						
Leach Sp	Ira Vail														1				
Will arrive late					-	-			-				-						-

#### Facts About This Year's Race at Indianapolis Briefly Told

Distance-500 miles. PRIZES First prize \$20,000 Second 10,000 Third 5,000 Fourth 3,500 Fifth 3,000 Sixth 2,000 Seventh " 1,800 Eighth " 1,600 Ninth 1,500 Tenth 1,400 Lap prizes 40,000 Accessory prizes 25,000

Total prizes ......\$114,800 Race starts—10 a. m.

Probable duration — About five and one-half hours.

Number of starters—24.

Grandstand accommodates 60,000 persons; parking spaces accommodate 200,000; expected attendance, 150,000.

Track measures 2½ miles to the lap, is 60 ft. wide with 2000 ft. turns banked at angle of 16 deg.

Referee — C. G. Sinsabaugh; honorary referee, David Beecroft; starter, Tom J. Hay; assistant starter, C. J. Root. Harry Stutz will pace with H. C. S.

or maybe the engine must be set back a few inches in the frame. These are all problems which must be overcome when the car is on the track for its trial spins.

#### DETAILS REQUIRE ATTENTION

It takes a great amount of time and patience to develop a car for a race like Indianapolis. Every part, no matter how minute, must be perfected. A race may be won or lost from the manner in which a car is put together. We have seen several minutes lost at the pits by the mere fact that sufficient attention was not paid to properly anchoring the spring which closes the throttle. It is a small detail, but when you are driving into the turns and momentarily wish to close the throttle and you find the latter stuck wide open, it becomes a serious matter.

When next Monday the victor of the Indianapolis sweepstakes crosses the line, you can make up your mind to one thing, and that is, that the builder of the car, the driver, and the corps of mechanics accompanying a racing team have done their utmost to get speed. The fact that they did so made it possible for that car to cross the line a winner, but long before the race the car was groomed for this particular event, the designer and builder have spent many months in the laboratory to make sure that not only would the vast crowd cheer their car a winner, but that it would, in the annals of a shop man, "stay put."

### Straight-8 Race Engine Popular

Duesenbergs, Ballot, Sunbeam and Frontenac Exponents of This Type—Flywheel May Be Dispensed with—Better Acceleration

EFORE taking up the discussion of the modern racing engine it is well to stop for a moment and see just what the first two or three major problems of the designers of this type of engine are. In the first place the designer's job is to get the greatest amount of horsepower out of a set of cylinders of a given dimension. Everything must be done in order to insure that every ounce of energy of the fuel be utilized in turning over the engine and ultimately delivering this energy in the propulsion of the car, and the faster this propulsion takes place the more the chances the car has of winning a race, other things

The designer of a racing engine does not care very much about silence of operation. This is of no importance. Here the problem is manifestly different from that of a passenger car engine. Except to a certain extent weight is of no great importance and fuel consumption is secondary, although obviously it does become an important factor at times. Many a race has been lost because a car had to stop for fuel at

a critical period.

Vibration is not important except if it becomes so bad that trouble is likely to ensue. In a sense the design of the modern racing engine is directly opposite to that of an aircraft engine, where the size of the cylinders does not matter, but where the weight per horsepower must be kept to the lowest possible point. Fuel consumption in an aircraft engine also is important.

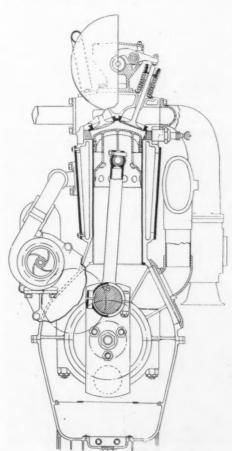
#### LARGE CRANKSHAFT FOR HIGH SPEEDS

It hardly has to be told here that the power obtained from a set of cylinders of a given dimension increases with the revolutions. This is true up to the speed at which it is practical to run the engine. It is not advisable to run an engine over a certain speed, because if this is done it means that the weight per horsepower increases. This is necessarily so because an engine that runs at excessive speeds over sustained periods

#### By B. M. IKERT

requires a very large crankshaft, large bearings, and other parts to take the inertia forces. It readily will be seen. therefore, that the weight of the engine is going to mount rapidly.

If we compare a modern racing car engine with an aircraft engine, we find something like the following: The aircraft engine will have cylinders of large diameter, a medium sized crankshaft, camshaft, crankcase, etc., and will usually run at its best around speeds of from 1300 to 2000 r. p. m. The race car engine, of the high efficiency type, will have relatively small cylinders, a huge crankshaft, etc., and may be run anywhere from 2400 to 3600 r.p. m.



End sectional view of the Frontenac engine built in 1915 by Louis Chev-This shows the iron liner in the aluminum cylinder block and also the cast iron valve seats

As yet there has been no work done along the lines of developing a straighteight engine, one in which the cylinders are mounted in a row, for aircraft work, but the last two years have seen a remarkable growth in the development of this type of engine for racing car use. One of its salient features is the fact that it practically can be balanced perfectly. This, of course, is not true of the fourcylinder engine, which up to the last two years has had the upper hand in racing and which incidentally won last year's Indianapolis race.

#### CRANK THROWS ON STRAIGHT. EIGHT ENGINE

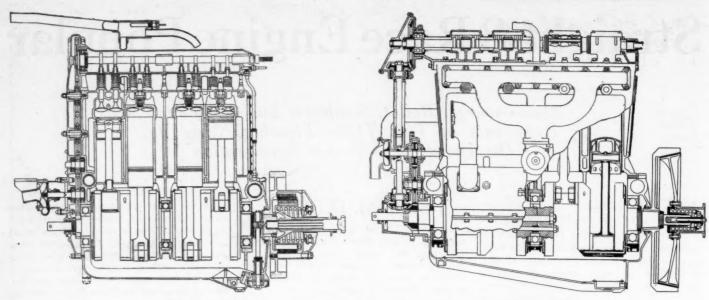
Many do not understand fully the disposition of the crank throws on a straight-eight engine and to throw additional light on the subject we show in connection with this article two illustrations of crankshafts as used in eight cylinder engines. At the present time there are two arrangements of the crankshafts which seem to give the best performance and insure perfect balance.

In the Duesenberg eights which made a creditable showing last year the crank throws are arranged as though two fourcylinder crankshafts were placed end to end and one of them given a twist so that its throws are at 90 deg. to the throws of the other. In fact the shaft is forged with the throws in a single plane, after which the shaft is given a quarter twist.

The other way of arranging the throws is assuming an ordinary four-cylinder shaft with half of another four-cylinder shaft placed at each of its ends, each of these halves being placed at right angles to it. This is the better arrangement, as the shaft then is balanced, whereas in the former case we have the equivalent of two unbalanced four-cylinder crankshafts. Such an engine necessarily will set up a rocking moment between the two sets of four cylinders.

When it comes to mechanical efficiency it is doubtful whether the straight-eight engine possesses any advantages over the four-cylinder. Some engineers claim that the straight-eight will absorb more power in friction than the four-cylinder or the six, owing to the relatively larger number of small bearings as compared with a few larger ones in the other engines. This also brings up the question of dependability.

Theoretically at least it is right to as-



#### Sectional Views of Engines Designed for Speed

Longitudinal sectional views of the early and late Frontenac engines. On the left is the engine which won last year's Indianapolis race, while the one on the right is the same as that shown on the previous page. Note that in the later engine the camshaft drive is by a series of spur gears rather than a vertical shaft and bevel gears

sume that a four cylinder engine will be more suitable than the straight-eight for racing, because when we multiply the number of wearing parts as is the case in the eight we naturally run the chances of having just so many more parts misfunctioning. However, in many of the races that were run last year the straight eight certainly demonstrated that it was a very reliable engine. Therefore, it is doubtful in the minds of many whether or not the four-cylinder is more reliable for racing than the straight-eight.

There will be a large number of both types in the race at Indianapolis this year and the results of their relative performance will be interesting to watch. Some of the more prominent users of the straight eight at Indianapolis are Sunbeam, Ballot, Duesenberg, Talbot-Darracq and one or two others. Most prom-

inent among the fours are the Frontenacs and Puegeots.

#### TRYS ALUMINUM FOR RACING ENGINES

Concerning the last two makes of engines there is a bit of history which is interesting because out of it all has come the development of the aluminum engine as exemplified by that used for the last five years by Louis Chevrolet in his famous Frontenac cars. Along about in 1915 Chevrolet, who had had up to that time considerable racing experience and who had watched the progress in racing made by Puegeot, knew that the engines of the Puegeot type had been developed to their highest efficiency and in order to beat them some other course must be pursued by the designers of race cars. It would not do to merely equal their performance; it must be surpassed. So Chevrolet turned to aluminum.

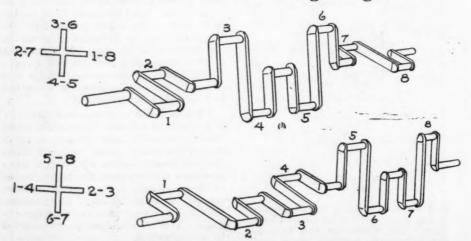
By the wide use of aluminum, Chevrolet was able to use a 300 cu. in. aluminum engine and chassis which complete weighed 500 lb. less than any similar car. Naturally this light weight did not mean so much in the way of speed increase as it did in the saving of tires and, therefore, a reduction in the number of stops during a long race. We show a cross sectional view of the early Frontenac engine.

Some of the steel parts which made up this engine weighed considerably more than the main body of the engine, such as the cylinder, water jackets, and crankcase. The crankshaft weight was 92 lb. and the flywheel, clutch, cone bearings 140 lb. The connecting rods collectively weighed 7 lb., the fore pistons 3 and the carbureter 10 lb. By using an engine of this kind it was possible to reduce the weight of the rear axle to 200 lb., whereas the average axle may run as high as 400 lb.

In the early Frontenac engine the cylinder walls did not come in contact with the pistons, but instead cast iron sleeves or liners of thin section were inserted into the cylinder bores to take the wear. These were inserted from the bottom of the bores and held in place by friction. They were introduced while the cylinders were at a high temperature obtained by steam in the water jackets.

They were, therefore, automatically clamped in place at normal temperatures when the cooling water was in the jacket instead of the steam. As the temperature on the inside of the cast iron sleeve rose so much higher than that of the water cooled aluminum which surrounded them, the cast iron sleeves expanded and tightened up inside of the aluminum rather than the aluminum expanding away from the sleeves.

#### Crankshafts Used on Straight Eights



Two layouts for straight-eight crankshafts. The one at the top is preferable because with it the engine is balanced practically perfect

It will be noted from the end section of the Frontenac engine that the seats for the valves are made up from iron castings with dove tailed edges and cast in the aluminum. This made the cast iron seats independent. The difference of the expansion of the cast iron and the aluminum did not affect the alignment of the adjacent cylinders.

This engine had a bore of 3.87 in. and stroke 6.37 which made it just under 300 cu. in. Chevrolet claimed that this engine was capable of developing between 135 and 140 hp. with 105 lb. per sq. in. compression pressure. The intake valves were made lighter and larger in diameter than the exhaust valves. In the valve operating mechanism a very short spring was placed inside of the main spring which made it possible to get the valve returned to its seat very quickly. The wide difference in the length of these two springs made it possible to dampen out any vibration which either one or the other of the springs might have had when running at a "critical" speed.

In order to use the ball bearings on the crankshaft it was necessary to make the shaft up in two pieces joined at the middle. It was held together by one large through bolt and three smaller ones. At the points where these smaller bolts passed the division on the crankshaft hardened steel bushings closely fitted were used to take the torque. They acted like keys and relieved the bolts of driving stresses.

#### PISTONS COOLED BY LARGE AIR BREATHERS

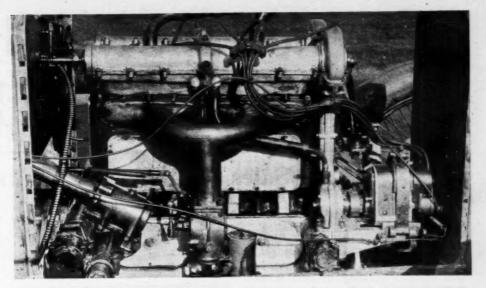
The early Frontenac engine used a single overhead camshaft driven by means of beveled gears instead of a train of spur gears as used in the Frontenacs of last year. The first Frontenac engines also had a train of three spur gears to drive the water and oil pump and the magneto. The spur driving and the beveled gears are attached to the front end of the crankshaft and made from a single piece to add strength and reduce weight.

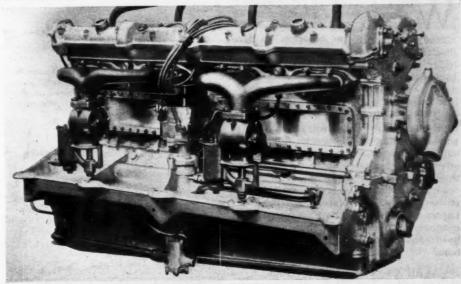
The Frontenac engines of last year differed quite a bit from the early engines particularly that two camshafts were used and a train of spur gears in place of the bevel gears and vertical shaft for driving the valve mechanism. Two oiling systems are used on this engine, one mechanical and the other manual. The latter is for emergencies only. Both are of the dry sump type, the oil being carried in an 8 gal, tank on the car and circulated by a two stage

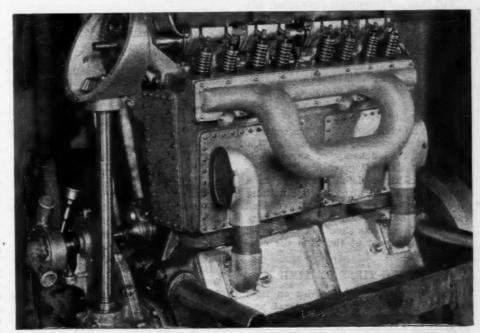
gear pump.

One of the interesting features is the cooling of the pistons. It was not thought desirable to dissipate the heat through the cylinder walls and water jackets because the wall area necessary in this case is so great as to make the pistons too heavy to travel at the required rate of speed. The designers of this engine have found it possible to air cool the pistons which fact accounts for the very large breathers on the sides of the engine, one in front and the other in the rear. Air enters in the front breather

Concluded on page 31







#### Engines Old and New to the Hoosier Oval

At the top is the engine used in the Puegeot to be driven by Chassagne and Note the manner of mounting this engine by means of trunnions. it is the eight cylinder Sunbeam engine. Instead of the two carbureters four will be used with a special form of air scoop as shown elsewhere in this issue. At the bottom is shown the Frontenac engine used in the 1915 cars. Note the large breathers

## ctical Tire Merchandising and Repairing by Stanley P. McMinn S. Mc Sales Methods and Contracts

Contracting with the Owner Selling Tires on Time Payments Estimating on Change-Overs

Cooperating with the Garageman The Conditional Bill of Sale How to Solicit Change-Overs

7HEN a competitor's salesman approaches the prospect he is very likely to say that he has already promised the business to Mr. So-and-So. In other words, he automatically thinks of the promise as an easy excuse to turn down the second salesman. Incidentally, this helps to make him believe that he is going to give the business to your salesman.

Signed orders are always the surest way of getting the business, but judge your prospect carefully. If he is the type of man who hesitates about signing anything, then do not ask him to sign an order. Make out the order before him. If he objects, tell him it is simply a memo. Leave the carbon copy of the memo with him. It will be surprising how many times such a memo will bring home the bacon.

#### USE OF TIRE CONTRACTS

The use of contracts covering tire requirements of an individual or of a concern, over a period of six months or a year, has been found to be an excellent way of getting business. Customers are given a small discount as an inducement for signing such a contract. It is nothing more than a discount for cash but appears more when properly placed before the prospect.

It will be understood that this contract does not specifically require that the purchaser take delivery of any definite number of tires. It gives him the privilege of taking a definite number at a definite place and discount, but nothing in its phraseology can be construed as making it obligatory on him to accept delivery. These facts should be impressed upon the prospect at the time the contract is signed.

#### SELLING TIRES ON TIME

The purchase of automobiles on time payments is a practice so general and the need for this practice is so well understood that there are few who question the merit of the system. However, the suggestion that tires should be sold in the same manner is sure to bring almost unanimous disapproval-until the matter is carefully studied.

#### What You Need to Know-

about the tire business will surely be found in a series which goes thoroughly into all the phases of the business as listed below-Don't miss any of them.

- 3-Handling the Sales Force
- Letters and Post-Cards
- Advertising
- -Window Displays -Salesroom and Office
- Service Station Facilities
- The Service Station
- 10-The Service Car and Its Equipment
- The Repair Department

- 12—Equipping a Shop 13—Tube Repairing 14—Fabric Tire Repair

The average dealer, in voicing his disapproval, will say that: "The man who cannot afford to pay cash for his tires cannot afford to operate his car; he should pay as he goes. Furthermore, the tire dealer who sells tires on this basis is courting disaster, for when a customer becomes dissatisfied with a tire, he will refuse to complete the payments. Frequently his dissatisfaction is not justified since it is due to his own neglect or abuse, but this fact does not alter the

#### MANY DEALERS USE THIS PLAN

However, the fact is that here and there throughout the country dealers are selling on time and making a success of it. There is a tire dealer in Indianapolis, two in Detroit, one in Boston, another in Bridgeport, just to mention a few specific cases.

There is a demand for tires on time and it is a sound demand that is worth recognizing and may be profitable to cater to. The theory is this: There are a host of honest people in moderate circumstances who own cars. It frequently happens that when the sudden necessity for a new tire presents itself the owner hasn't enough money to spare to purchase a good, new tire. Yet he must have a tire at once.

The result is that he buys a tire of inferior make, or a "second" or some other kind of a "gyp" tire. He knows he is paying dearly for the mileage he thus buys and he would much rather have a tire of recognized quality.

The time payment system permits him to buy a good tire even though he may be temporarily a little short of ready cash. This is the theory back of the system and it works out well. Many owners of small trucks and particularly jitney bus owners are also in this class.

#### PROPER CONTRACT NECESSARY

The success of the system depends on the use of a reasonable amount of discretion and a good contract form. The dealer must look up the standing of the purchaser and satisfy himself that his record is sufficiently good to justify the sale of a tire on this basis.

Too much stress cannot be laid on one point: the tires thus sold must be good

An initial cash payment of at least one-third of the price of the tire should be secured and the remaining payments should not extend over a period of more than three or four weeks. As a specific example let us consider the accompanying contract. The purchase consists of a tire costing \$90 and a tube costing \$15, the total being \$105. A cash payment of one-third or \$35 is made. The balance, \$70, is split up into four weekly payments of \$17.50 each.

This form is made out in triplicate, the original being retained by the dealer, one copy going to the purchaser, and another being filed in the county clerk's office. All documents filed with the county clerk must be sworn to. This becomes a simple matter by having one of the members of the firm a notary. Filing the document in this manner is advisable wherever the law makes such a provision.

#### CONDITIONAL BILL OF SALE

The contract is patterned as closely as possible, after the Morris Plan contract, and offers good security. Additional security is afforded by the note for \$70 which the purchaser gives, as illustrated.

The note and the contract are printed on one sheet of paper for convenience and also to make the document look less formidable.

The first paragraph of the body of the contract mentions a refund if the payments are promptly met. Some dealers use this feature but it is seldom necessary to use this clause, although it is included in the contract.

The contract provides that the title to the tire remains with the seller until the tire is paid for; that the seller shall not dispose of the tire until it is paid for; that in case of default the purchaser shall return the goods on demand; that in case of default the seller has the right to take the tire without any further notice.

In the statement of the purchaser's assets it is sufficient to put down a "yes" or "no" answer to the contract, although it is a good plan to make a more detailed memorandum on another sheet of paper of what these assets are.

A cardinal point in the plan is to have the contract drawn up by a competent lawyer, for while the form shown may be correct for some states, something entirely different may be required in others. No one but a lawyer is qualified to draw up such a contract.

#### REPAIRWORK FROM GARAGES

It is quite possible to build up a respectable volume of repair work among the various garages and gasoline filling stations in your city. Perhaps the best way to do this is to call on each garage and filling station individually, explain that your shop is fully equipped to handle every kind of repair work, and in this way solicit the business.

Few garages have equipment for repairing tires. Many of them have a lot of tire repair work that is left by car owners. This may be going to someone else who is, perhaps, not so well equipped as you are, or who has workmen who are less experienced. These are two reasons why you should have the business.

However, garagemen will not bring the business to you of their own free will. You must fight for it. You must keep eternally after it. The best way is to have your service car make regular daily calls at all the garages and pick up all the work that is ready. On the next daily call, return the finished work and take away anything else the garageman has for you.

#### HELP GARAGEMAN GET BUSINESS

The garageman may complain that his customers are not leaving their repair work with him. In this case you must do something to induce the customers to leave it. One good way is to have a small card printed and put one in each car. Such a card would tell the car owner that the garageman can take care of tire repair work for him.

Don't put your own name on such a card. Instead, put merely the line "LEAVE IT WITH THE GARAGEMAN." This gives the garageman some incentive to work for you because it means profits in his pocket every time you get a repair job.

It is customary to allow garagemen a discount of 25 per cent on repair work. You can do this quite easily and still make a small profit. The garageman, of course, makes 25 per cent clear, and has no work to do other than to collect the casings and tubes for you. You render your bills to the garageman, less his discount, and the garageman bills the customer at your regular list price.

#### CHANGING SOLIDS TO PNEUMATICS

Another highly profitable source of work that your salesman should be instructed to solicit is the changing over of solid tire equipment on certain trucks to pneumatics. More of this work is being done every day. Owners are beginning to realize that for certain work the use of pneumatic tires effects a great saving in gasoline, oil and depreciation on the truck.

Obviously, you would not suggest that a 5-ton truck hauling sand or coal for short distances around the city, be changed over to pneumatics. Such a recommendation would be foolish. Pneumatics have no place for work of this character. But where a 2-, 2½- or 3-ton truck is making daily trips of 75 or 100 miles over fairly good roads, it undoubtedly will effect a considerable saving for the owner to equip the front of the truck at least, with pneumatics.

#### HOW TO SOLICIT THE WORK

The way to solicit this work is first to consider very carefully whether pneumatics will do the work and whether it is advisable to suggest the change. Having decided that the change would be advantageous to the owner, the next step is to decide the proper size of tires to

This may be done very easily by runing the front end of the truck on a scale, the truck being fully loaded, of course. Then when you have the weight carried

by the front tires it is a simple matter to refer to tables issued by the various tire manufacturers and choose a size of tire designed to carry that specific weight.

It will be necessary, of course, to have the truck wheels altered to fit the new rims for the pneumatic tires. This can only be done by a qualified wheelwright and should not be attempted by anyone else. The charge for such work is generally in the neighborhood of \$16 a wheel, with a discount of 20 per cent to the dealer. The work on a pair of wheels can generally be done in half a day

#### MAKING AN ESTIMATE

An estimate for converting a pair of wheels to pneumatics would figure out about like this:

Woodwork on two wheels at \$16\$	32.00
2-36x6 rims complete	32.40
2-36x6 cord easings	220,80
2—36x6 tubes	24.80
Excise tax on \$245.60	9.46

\$319,46

Such figures will vary slightly with the size of tires recommended, but these are all the factors that need be considered in making such a change.

It is very seldom that a dealer will be called upon to change a truck from pneumatic to solid tires, but where this is necessary, the same plan can be followed. First get an estimate from the wheelwright covering the cost of altering the wheels. Then figure in the cost of supplying the new solid tires after having determined the proper size to use by weighing the truck and referring to the tables issued by the various makers of solid tires.

Drawing Accounts—Rates of Pay for Salesmen—the Point and Bonus System and Repeat Orders will be taken up next week.

#### Carrying Capacities and Inflation Pressures of Pneumatic Tires

(S. A. E. Standard)

T.	Fabric Tires for Passenger Cars		Cord Tires for Passenger Cars		Cord Tires for Commercial Vehicles	
Tire Size	Maxi- mum Load per Tire, Lb.	Air Pressure, Lb. per Sq. In.	Maxi- mum Load per Tire, Lb.	Air Pressure, Lb. per Sq. In.	Maxi- mum Load per Tire, Lb.	Air Pressure, Lb. per Sq. In.
3 1/2	375 570	45 55	400 600	40 50		s. s. s
4	815 .	65	850	60	850	70
41/2	1100	75	1200	70	1200	75
5	1500	85	1700	80	1700	80
6					2200	90
7					3000	100
8					4000	110
*9					5000	120
*10					6000	130

\*The loads and pressures for these sizes are S. A. E. Recommended Practice only.



#### EDITORIAL



#### The 500-Mile Race

Indianapolis track will be history. There will then have been run probably the greatest race of its kind since the inception of the Hoosier oval. The cars are faster this year than ever before and the lap prize money of \$200 is an incentive for the drivers to literally burn up their mounts. France has formidable contenders in the two Puegeots, England in the Sunbeams and America in the Duesenbergs and Frontenacs, to say nothing of some of the individual entries.

There is every indication that the average miles per hour will go up this year. The smaller engines demonstrated their staying qualities last year and it will be remembered that at the Elgin road race last year there was but a single pit stop.

The prize money this year amounts to more than in previous races. There is a worth while purse to go after. True, there will be many drivers who will seek to drive to stay in the money, making no attempt at the lap prize. But, in the main, the stars are going to drive wide open and such a procedure is bound to bend the curve of speed upward.

Along with the glory of winning a race goes the item of expense. The spectators, cheering the winners for their "easy money," probably never stop to figure out what it has cost to get these cars on the speedway. It may be a surprise to many to know that a front axle costs as much as \$1000. Last year eight connecting rods, machined all over, were made for a race car and they cost \$93 a piece. It is not only the car itself which costs money but the extra parts. It is common for a race car to have three and four sets of pistons, several cylinder blocks, camshafts, axles, etc., all of which cost vast sums of money. Yes, it is great to win a race like the Hoosier classic, but it is an expensive victory.

#### Errors in Sales Plans

OT long ago we received a communication from a man who represents, perhaps, the average car buyer. We think this man's letter worthy of reproduction in this publication. It is well worth reading by every dealer. Here is what it says:

Naturally, in the sale of any specialized article the salesmanship displayed is above the ordinary. As an illustration, it is accepted among practically all sales people that it requires less sales ability to market a staple product than it does to market a specialty. You would expect to find a much more efficient sales organization in any locality marketing, for instance, Burroughs Adding Machines than you would marketing the product of some wholesale grocer.

Automobiles are ordinarily classified as specialty sales, that is, they are specialized sales and the public has a right to expect unusual sales ability in the marketing of them. I have no doubt but what your experience has shown you that there is an unusual lack of sales ability in many instances in local sales agencies.

I bought a new car this spring. There was a car sold in this town, which was a new model of one of the old standard motor car manufacturers. It was about the type of car I

wanted, and it had been explained to me in detail by a friend. I went down to the sales room, which is quite an elaborate place, to see this car. I went in—there was no one in the office. I walked on through the office portion, which was beautifully fitted up and well displayed, into the garage proper. This building is approximately 150 feet long. At the extreme opposite end of the building were two colored men washing a car. I asked them if they knew anything about the new model car, and they didn't. They knew nothing about where the proprietor was or any of the salesmen. I walked back toward the office, passed a mechanic, and asked the same questions, and got no information. When I got back to the office there was a bookkeeper or office man there. I inquired from him and got no information. They didn't even ask me my name or make any effort to find out whether I was interested.

I left the place, went down to another establishment and got almost exactly the same treatment. The result was that I bought a car of the same make that I had previously, because the man handling that car made an honest effort to sell me.

This is not an unusual case. I went through two automobile shows this last winter and in one show particularly there were, I should judge, 60 or 70 exhibits or exhibitors. At just two of these exhibits was there any sales effort shown. In most of the other cases they were not sufficiently interested to find out whether you expected to buy a car or what your name was.

I have concluded that in a good many cases automobiles are sold in spite of the local sales agencies and not because of them. I am also convinced that if the sales work was brought up to the proper standard that the automobile sales in the United States could be increased immediately 15 to 25 per cent.

#### Better Headlight Illumination

THERE still remains a great deal of work to be done in the way of road illumination for motor vehicles.

Countless devices have been brought out to furnish a driving light, at the same time avoid glare and meet with the laws of various states. Some of these devices, while considered legal in many states, do not give to the driver the best light. This is true for several reasons.

In the first place the proper solution of the lighting problem is one on which the lamp manufacturers, the car makers, the bulb makers, reflector makers and lens makers must get together. Take bulbs, for instance. Hardly any two filaments are alike and it is impossible to focus a lamp properly if the filament is not right. Many cars are still made on which it is impossible to focus the lights and it is very difficult to fit up such a set of lamps to meet with the requirements of a good driving light and at the same time be legal.

We believe the time will come when dealers will add the headlight adjusting department to their service work. It does not require expensive equipment. Many dealers now sell their cars equipped with lenses or other devices to meet with the laws of the state, but this is not sufficient The customer must be sold illumination. He should not be obliged to have part of his lamps covered up for the sake of complying with a law when such a procedure robs him of 20 or 30 per cent of his light.

## Senators Hear Tax Arguments

Representatives of National Automobile Chamber of Commerce Appear Before Finance Committee on Question of Internal Revenue Revision—Plead Against Imposition of Unfair and Discriminatory Levies

7ASHINGTON, May 19 -Congress has received the tax program of the automotive industry which was offered for their guidance in the internal revenue revision. Spokesmen for the industry impressed upon the Senate finance committee the utility of motor vehicles and the urgent need for relief from the oppressive and discriminatory burden of taxation. While members of the committee criticised and questioned many of the suggestions for fiscal legislation they indicated that they had a new vision of the magnitude and importance of the automotive industry and its relation to the political and economic structure of the country.

Characterization of the present mode of taxation as it applies to the automotive industry as "stigma" taxes revealed to the Senators the inequities under which the automotive industry struggled back to new levels of industrial activity. There were unmistakable evidences of the hostility of Senators to the proposal that the excise tax be abolished. Their opposition was apparently founded on the supposition that such abolition would pass the burden of highway maintenance upon all classes without distinction as to the users of these arteries of commerce.

#### HIGHWAYS USED BY ALL

Representatives of the industry impressed the committee with the fact that the highways were now in general use and not confined to motor vehicles, although automobiles bore the entire expense of maintenance, and in some cases cost of construction.

George H. Graham, vice-president of the Pierce-Arrow Motor Car Co. and a member of the taxation committee of the National Automobile Chamber of Commerce, limited his presentation to the specific effects of the present tax system upon the automobile industry. He appeared also for the Motor Accessory Manufacturers Association. Criticizing these levies as "stigma" taxes served its purpose for it constantly brought to the minds of his auditors the fact that the industry was signaled out for heavy and iniquitious assessments. He illustrated the effect of such taxation by comparing the proposed taxes to such regulatory taxes as are levied on liquors, narcotics,

## Proposition of Federal Government to Tax the Industry

HEARINGS have started in Washington on proposed Federal legislation to impose heavy taxes on the automotive industry.

The following recommendations of special interest to the industry have been made by the government:

1—Increase of the sales tax from 5 per cent to 10 per cent, which it is estimated will result in an increase of \$100,000,000.

2—A Federal license of cars based on 50 per hp., \$100,000,000.

3—A consumption tax on gasoline at 2 cents per gallon, \$90,000,000.

4—The truck sales tax will be continued at 3 per cent despite efforts to have it eliminated.

New taxes from industry, \$290,000,000.

dirks and dangerous weapons, the purpose of which was to regulate or even suppress, rather than encourage the use of them.

Graham made an effort to disabuse the minds of the Senators as to the term "non-essential" and is application to the industry. He said that at the time it was originated preference in the matter of materials, transportation and labor were given to industries most essential to war activities, but that time had passed. However, the stigma had not been lifted from the automobile industry now recognized by President Harding and others as one of the most important in the country.

#### A TAX ON TRANSPORTATION

It was his contention that a tax on motor vehicles was definitely a tax on transportation. His statement that the railroads have a monopoly after rights of way are constructed was challenged by Chairman Penrose. Graham made it clear that there were no Federal taxes on other units of transportation and that the industry should be relieved of the sales tax on cars, trucks and repair parts. Replying to a statement of Senator Simmons of South Carolina, ranking Democratic member of the committee, that the Government did not build the road beds for the rail carriers as it did for the auto-

motive industry, Graham pointed out that nobody ever heard of steamships digging their own channels or building their own harbors, but that the government paid for it. He said that the industry pays enough for the maintenance of all vehicles. Graham placed the automobile industry in favor of a sales tax, provided it is extended to all industries and as such would be equitable. Objection was made as to confining it to the automotive industry because it would be highly discriminatory.

Stressing the fact that one-third of all the automobiles now in use in this country have been purchased by farmers, Graham showed the committee the utility of motor vehicles and the places and persons affected by discriminatory taxes.

#### INDIVIDUAL TRANSPORTATION

"Of the 9,000,000 automobiles in the United States," he said, "6,000,000 are purchased into homes who total income is \$4,000 per year or less. It is a fallacy to refer to the passenger automobile as a pleasure car, it is actually a medium of individual transportation. A careful survey shows that 90 per cent of all passenger cars are at sometime used for business purposes, and that 60 per cent of the passenger car mileage is utili-Time permits only a hasty glance at varied public service now rendered by the motor truck. It aids in the distribution of food, fuel, raw material and manufactured articles. In the United States 26,000,000 food purchasers are trying to feed themselves, 79,000,000 additional American citizens, and many Europeans. It is an enormous task. It has been made harder by waste from inadequate distribution."

As to its essentuality from the standpoint of the farmer, the National Automobile Chamber of Commerce's spokesman contended that the automobile had given the farmer a wider producing area, definitely lowered food stuff costs, shortened time of transport to market and increased the farmer's producing hours on the farm; insuring prompt arrival of perishable items at the door of the consumer when they are in the best condition and commanding the highest prices.

He told the Committee that there are now known to be 3,000 regularly established rural motor express lines in operation, and some of them involve a considerable investment. Many legislators have voted for legislation inimical to the motor truck from a feeling that they thus served the interests of the farmer. No error could be greater. The motor truck offers a haulage economy. It per-

(Concluded on page 31)

#### Dort, Hupp, Scripps-Booth and Maxwell Prices Lowered

#### President Jewett Notifies Paige Dealers of No Immediate Prospect for Reduction

FLINT, May 19—Effective at once the Dort Motor Car Co. announces price reductions as follows: Touring car and roadster from \$1,215 to \$1,115; coupe, \$1,865 to \$1,685; sedan, \$1,995 to \$1,835.

"These reductions are on the new model Dort cars first introduced in January of this year," John D. Mansfield, general sales manager of the company, says. "As the new Dort is not a prewar car we, of course, are not endeavoring to establish pre-war prices for there is not a pre-war price standard from which to judge these new models. Dort prices have been lowered because we have reached a production basis that enables us to operate on a lower overhead per car built."

Detroit, May 19—Announcement of a price reduction of from \$200 to \$325 on Hupmobiles has been followed by a statement from President Harry M. Jewett, of the Paige Motor Car Co., who declared there was nothing in sight to justify a Paige reduction in the immediate future and he did not look for such condition until fall

#### No Reduction at Present Time

The Paige company now is working four days a week and is back at about 60 per cent production after having reached close to normal within the last two months. This curtailment, Mr. Jewett said, was due entirely to recent price changes which have unsettled conditions and handicapped the manufacturers.

Paige has sent a notice to its dealers that there would be no reduction now and none in the near future. President Jewett said he did not believe in guaranteeing prices but there was nothing in the cost of manufacture to justify any price reduction insofar as his company was concerned. This view also was taken by other manufacturers though in the statements of each there was the unspoken reservation that further cuts might force all of them to fall in line.

Hupp open models are now selling at \$1,485, coupes \$2,400, sedans \$2,485. Former prices were open models \$1,685, coupe, \$2,725 and sedan \$2,800.

Chicago, May 19 — Purchasers of Stephens cars are guaranteed the present list prices until Jan. 1, 1922, according to an announcement from the factory.

Lansing, May 19—Because Oldsmobile prices in December were based on the expected reduction in the price of material, etc., which have taken place within the last few weeks, Edward Ver Linden, president of the Olds Motor

Works, says, Oldsmobile prices will stand as they are.

Detroit, May 20—The prices of the Maxwell on its four models have been reduced \$150, effective at once. This is the second price revision made by the new organization, the total reduction from the high level, since Sept. 28, 1920, being \$310 on open cars and \$350 on closed cars. The new price list is as follows: Touring car, \$845; roadster, \$845; coupe, \$1445; sedan, \$1545.

Detroit, May 20—Scripps-Booth prices have been reduced effective today as follows: B-39 touring car from \$1545 to

#### Sentiment of Bankers Undergoes Change

MINNEAPOLIS, May 19—The following statement in reference to automobile conditions containing the monthly review of business conditions issued by the Northwestern National Bank, the largest in the northwest, indicates the change in sentiment toward the automotive industry on the part of bankers:

"Automobile sales now are looked upon by many as one important index to business conditions. Although the industry is not so basic in character as some that by the rise or fall of their activity affects conditions generally, it has become so great in recent years that its availability for general guidance is more generally recognized."

\$1295; B-40 roadster, \$1545 to \$1275; B-41 sedan, \$2295 to \$2100; B-42 coupe, \$2215 to \$1950.

New York, May 19—Price on Sterling tires and tubes have been reduced 15 and 20 per cent, the minimum cut being made on Ford size fabric tires and the 20 per cent reduction being made on all other fabric and cord tires and on gray and red tubes.

#### Jordan Price Cut Depletes Stock Held by Distributors

Cleveland, May 20—The Jordan Motor Car Co., in a report on results of the first ten days' sales following the recent reduction in price, states that the sales by dealers throughout the country during that time were five times those of the previous corresponding period. Applications from new dealers totalled 287.

The shipments in April had exceeded those of March by 200 cars. Shipments in May now under way will be twice those of April, it is announced, surpassing the biggest production month the company has had, while the specifications already coming in for June indicate the production will be 800 cars. Already the distributors' stocks of Jordan cars have been depleted.

#### Orders in Chevrolet Branch Taken Care of Day of Receipt

#### Business Through New Oregon Building Expected to Aggregate \$12,000,000 Yearly

PORTLAND, Ore., May 19—Almost coincident with the drop in the Chevrolet price, the Chevrolet Motor Co. of Oregon, distributor for the northwest, moved into its new home at the corner of East Third and Salmon streets. The company is the factory branch for the Chevrolet, headquarters for district No. 20, which includes Oregon, Washington, Idaho and western Montana. In moving into its new home the company occupies one of the finest buildings in the wholesale automobile business in the Pacific northwest. The structure was erected expressly for the Chevrolet, which is occupying it under a long time lease.

The building is two stories in height with a full basement and covers half a block. It provides 60,000 square feet for storage and office space and can care for from 700 to 1,000 cars at one time. M. O. Douglas, who is manager of the local branch, stated that business through the plant would aggregate \$12,000,000 or more a year.

The building is erected with trackage on both sides, and is arranged for quick loading and unloading, three or four freight cars being accommodated at one time in the loading quarters. A feature of particular interest to the northwest trade is the parts room, where over \$10,000 worth of steel bins have been installed. The department is so arranged that any orders received up to 2 o'clock in the afternoon are taken care of that same day.

#### Car Dealers in Los Angeles Employing Business Manager

Los Angeles, May 20—The Motor Car Dealers' Association at the meeting last week held its annual election of officers. Fred Albertson was re-elected president; Paul Hoffman, vice president; Harris Hanshue, treasurer; Andrew Baldwin, secretary and H. L. Arnold, L. V. Starr and Ralph Hamlin, directors. The other officers are directors also.

The fiscal year just ended has been one of many successes for the association. During that period a show was held the proceeds of which added approximately \$25,000 to the treasury. The organization decided there was work enough to require the undivided services of a capable man so a business manager was employed. Arrangements were made to occupy one floor of the new building now being erected by the Automobile Club of Southern California as a permanent home. There are now seventy members of the association.

Plans for the annual outing, which this year will be held at Big Bear Valley, were reported as progressing. In connection with this event there will be a reliability run.

#### Denounce Rumors That Ford Will Close Factory in July

#### Officials Point to Speeding Up of Production to Take Care of Orders

DETROIT, May 20—Rumors current throughout the industry in Detroit that the Ford Motor Co. would close down July 1, are denounced by Ford officials who point to the remarkable demand and the fact that the company now is far behind its orders. As evidence of the effort to speed up production in response to demand, Ford officials pointed to the fact the company now is producing more than 4,000 cars and trucks daily. This output was reached about a week ago and is expected to be maintained for an indefinite period.

While the present schedule marks a record for this year or since the factory started in February, it is several hundred cars behind the record output which was reached on Oct. 20 when 4,688 cars and trucks were turned out. The company produced more than 90,000 cars in April and on May 3 a mark of 3,863 was reached, constituting a 1921 record up to that time. The following day the plant turned out 3,992 cars; two days later, 4,042; on May 9, 4,072 were produced and the following day 4,083 which still stands as a record for this year. The tractor plant also is running almost normal and the ten-thousandth tractor came off the assembly line May 3.

During the peak months last year and at the time the plant closed down in December, Ford was employing close to 60,000 men with the daily output averaging around 4,200 cars. The present daily output is being produced with approximately 40,000 men. This includes employees in Highland Park and the assembly branches. Ford now is paying the bonus each pay day rather than at the end of the year in order that men leaving the plant at any time during the year will not be deprived of their share in the bonus. The amount due each man at the end of the year is divided into 26 installments and he receives one twentysixth of his yearly bonus each pay day. This gives an average of about \$6 per man.

Detroit, May 21-The Ford Motor Co. has abolished the yearly bonus, according to the Ford "News," official organ, and in lieu thereof has increased wages in an amount aggregating what each employee would receive annually under the bonus system. This is paid in twentysix installments on the regular semimonthly pay-day. Announcement was made this week that the bonus was being paid in installments in order to protect employees leaving before the end of the The "News," however, corrects this announcement and states it is designed as a wage increase and applies to every man on the pay roll May 1. The statement also says the plan to supplant the bonus was decided on last January

and all employees on the roll May 1, who have been working since the plant reopened in February will receive back pay in an amount equal to the difference between the wages already received and the amount they should have received under the increased wage plan. In order that all employees may understand that the bonus has been discontinued and know what his increased rate will be together with the number of back payroll hours to which he is entitled, cards bearing the information are being inserted in pay envelopes. Men employed since May 1 are being paid at the standard rate which the "News" says provides a "minimum of 75 cents an hour." The discontinuance of the bonus does not affect the investment plan under which employees may invest up to one-third of their wages.

#### Business in Dallas Keeping Pace with That of Last Year

Dallas, May 20—During the month of April a total of 537 new automobiles were sold and registered in Dallas county. In the same period last year 573 were sold, evidencing that business this year is about as good as a year ago. Dealers declare that the sales for the first two weeks of May have been better than for the same period of last year.

Tire dealers assert that their business right now is better than it was a year ago. Accessory dealers say that they are enjoying better business than last year and repairmen state that many persons who have old cars which they thought they would use no more are having them overhauled and made new.

One thing connected with the sales of cars in Dallas is the fact that the majority of the cars sold are those of a make which sells for from \$1,200 to \$2,500.

Automobile dealers in Fort Worth and Wichita Falls declare that business during April was better than for the same cities period last year. From other North Texas cities and towns dealers report business improving, repair men making similar reports. The truck business appeared to suffer a set back during the past month which is believed due to the heavy truck tax law which becomes effective in July.

Dallas, May 19—The discount rate on commercial paper has been lowered by the Federal Reserve Bank of Dallas from 7 to 6½ per cent. This removes the last 7 per cent rate in the system. With this action the reserve board has finished eliminating the 7 per cent rates on business paper. Four of the twelve banks now have a 6½ per cent rate and the rest 6.

#### LAST NEW JERSEY TOLL ROAD FREE

Philadelphia, May 19—The last toll road in New Jersey, the Gloucester-Woodbury turnpike, becomes a free highway tomorrow. Under the State highway act the commission has the authority to acquire this road from the Gloucester Turnpike Co., which will receive therefor a check for \$70,000. The Gloucester Turnpike was established in 1850.

#### Overtime Appears Again in Fort Wayne Automotive Plants

#### Further Evidences That Business of Industry Throughout Country Is On Upward Trend

FORT WAYNE, May 20—For the first time since the automobile depression struck this city shortly before last Christmas, overtime work has made its appearance in some of the local automotive manufacturing concerns.

Among the concerns which have been forced to inaugurate overtime in some departments in order to catch up with their orders are the local tank and pump companies and the Dudlo Mfg. Co., maker of automobile magnet wire.

Every indication is that the business depression is fast being dissipated as far as the local automotive manufacturing companies are concerned. And local automobile dealers state that sales so far this spring have been very satisfactory.

Toledo, May 19—There are 1,200 workers now on the payroll at the plant of the Electric Auto-Lite Corp., one of the subsidiaries of the Willys Corp., here at the present time, according to C. O. Miniger, president.

Two weeks ago the force numbered only 800. The farm lighting business as well as the automobile lighting plant orders are picking up he reports.

#### **Equipment Plants Increase Forces**

Nearly 200 men are now being employed at the Toledo Chevrolet plant where transmissions are assembled. A few at a time are being called back to work.

Daily additions to working forces are being made at other automotive equipment plants here. The Mather Spring Co., the Bunting Brass & Bronze Co., the Milburn Wagon Co., and the Champion Spark Plug Co., all report increased business in the last two weeks.

Syracuse, May 19—The entire production of the Franklin factory for May was sold out by May 10 with the exception of 21 cars, business being widely distributed over the entire country. The month's output will be in the hands of customers or enroute to customers by June 1. Since Feb. 1 the factory has been operating at 100 per cent normal and has been turning out 40 cars daily. During April Franklin dealers placed in the hands of customers 944 cars.

New York, May 19—A summary of sales of Studebaker cars in the Greater New York district to April 30 shows 1,029 sold to this time, only ten less than for the whole year of 1920. Sales in April were 386 cars, as compared to 149 in April, 1920. The 1,029 cars sold in the first four months of this year represent an increase of 529 over sales for the first four months of 1920.

#### Every Sixty-second Visitor at Chicago Show Used Car Buyer

#### Last Year Sale Was Made to Each 76 Persons Attending Annual Exhibition

C HICAGO, May 18—Continuation of the used automobile show as an annual event is assured, according to dealers who exhibited at the Fourth Annual show just closed at the Coliseum. Despite price cuts in new cars announced during the exhibition, the final check-up of figures by the Chicago Automobile Trade Association, under whose auspices the show was staged, indicates that this year's event compared very favorably with the show of 1920.

Of approximately 700 motor cars inspected and appraised by the mechanical inspection and appraisal committee, 206 were sold at the Coliseum during the nine days of the show for a total of \$275,670. However, of such far reaching effect was the show, dealers report at least a duplicate of this figure sold in their showrooms, in many cases the buyer finding a car sold at the Coliseum and being sold a duplicate on the dealer's sales floor.

During the 1920 show, which was held at a time when the public was generally supposed to be in a much keener buying mood, 222 cars were sold for a total of \$396,165. The average price of cars sold was \$1,750. During this year's show the average price was \$1,337. The comparison is easily explained by the trend of lower prices in the automobile market.

One of the facts about the show most interesting to those who sponsored it is that while but one car was sold during the 1920 show for every 76 persons who attended, at the recent show one car was sold to every sixty-second person who walked through the Coliseum door. This is proof to the dealers that actual buyers, not curiosity seekers, are the people who make the show possible.

With a total of 19 cars sold, the Hudson Motor Car Co. tops the list of exhibitors, in sales, as well as in the total volume of business. Thos. J. Hay, Inc., sold 14 cars and third in the race was the Chicago Sheridan Co., which sold 12 cars.

#### Walter C. White Chosen New President of Truck Company

Cleveland, May 20—The first shift in the personnel of officers of the White Motor Co. since it was organized was announced at the close of the annual meeting of directors which followed the stockholders' meeting. Windsor T. White resigned as president of the company and was elected chairman of the board of directors. He is succeeded as president by his brother, Walter C. White. A. R. Warner resigned as secretary, being succeeded by T. R. Dahl, former assistant secretary, but still retains his place on the board of directors. E. W. Hulet, second vice-president, will remain with the

All three officials have been with the company for seventeen years or more and while the active management will hereafter rest on the shoulders of more youthful men, yet the men who have been active for so many years will be available.

active for so many years will be available for advice and counsel. The new president has been senior vice-president of the company for some time and for years has been active in the management of the corporation.

Walter C. Teagle, president of the Standard Oil Co. of New Jersey, and William G. Mather, president of the Cleveland Cliff Iron Co., were elected directors.

The retiring president told the stockholders and the directors that in his opinion the low point in business, not only in the automobile industry, but in other lines had been passed and that from now on business would continue on the upgrade. Evidence of this was manifested in the report of the company. The regular quarterly dividend of \$1 a share was declared and will be paid on June 30 to stockholders of record June 15. The company has started on a four day a week schedule after having been working three days a week since March 1.

#### Ten Thousand Motor Trucks Are in Operation in Oregon

Portland, May 20—There are now approximately 10,000 trucks in operation in the state of Oregon, according to a report by the motor vehicle department of the secretary of state's office at Salem. The report shows that the total number of trucks now registered in this state is 9870. This is the first report dealing exclusively with trucks ever made by the vehicle department since the registration law went into effect.

Multnomah county, in which Portland is located, has nearly half of the total number of trucks in the state, the report shows, with 4461 registered. Of the total number registered under the state law, 3842, or more than one-third, are from 1-ton to 1½-tons capacity, while 3905 are under 1-ton capacity.

The total of trucks of 1½ tons capacity or less is thus shown to be 7747, or approximately four-fifths of the total number in the state. Of the larger trucks there are 866 in the two-ton class, 362 at two and one-half tons, 202 of three tons, 390 of three and one-half tons capacity, 53 of four tons, and 150 in the five-ton classification.

#### FURTHER CUT BY BODY COMPANY

Cleveland, May 20—The United Automotive Body Co. has notified manufacturers, dealers and distributors if a second price reduction, averaging 25 per cent, the second of its kind within four months. This puts the prices in many cases below pre-war costs. The reduction is made to stimulate sales and as an incentive toward larger chassis sales.

H. L. Rackliff, who has been acting as sales manager, has tendered his resignation and is no longer connected with the company.

#### company acting in an advisory capacity. Penn Trucks to Bear Name of All three officials have been with the ompany for seventeen years or more and Dealer Who Is Selling Them

#### Imprint on Radiator and Rear Is Aimed to Retain Individuality of Seller

PHILADELPHIA, May 19—Something distinctly new in the policy of truck manufacture is in operation at the new factory of the Penn Motors Corp., Riverton, N. J., whose headquarters for sales is in Philadelphia. President Hilton W. Sofield states that the corporation will manufacture Penn trucks for the dealer, something that never has been done before, this being an application of the brand tire idea for the first time to trucks.

While the product of the factory will be generally known as Penn trucks of two tons' capacity, the corporation, as a special inducement, and having in mind the benefit of the dealer will, where the dealer prefers it, have the trucks made with his name on the radiator and rear, exactly as if they were manufactured by him, thus not only advertising the dealer, but also giving the truck for that territory an individuality. There are certain restrictions, however, where the dealer's name is used.

#### Will Manufacture Light Truck

Already orders for more than 100 trucks have been received and it is expected that the first will be finished within six weeks. There is one large building, 80 by 220 feet in use at the factory, with several small outbuildings. It is planned to manufacture a light truck in time, and before long the matter of making a passenger car will be taken up.

Speaking of his new plan, Sofield said: "We had in mind making it easier for the dealer who very often, just after he has succeeded in working up a good business, is informed by his factory that he will be removed from the territory and a branch factory established at that point, 'because business seems to warrant it.' Usually this business has been made possible by the man who, in such a case, has to suffer for it, instead of being rewarded."

The officers of the corporation, which is incorporated under the laws of New Jersey, are: Hilton W. Sofield, president; Howard S. Sofield, treasurer and Charles B. McGuire, secretary. The directors are the foregoing and Dr. W. W. Beveridge, L. H. Collins and George A. Small. The authorized capital stock is \$300,000.

#### AMARILLO DEALERS ELECT

Amarillo, Texas, May 19— Walter C. Ervin of the Cooper-Irvy Motor Co. of this city will head the Amarillo-Panhandle Automobile Association for the next twelve months. He was elected president at the annual meeting of the organization held here. E. E. Roos was chosen first vice-president and J. R. Riggs, second vice-president.

#### Maxwell-Chalmers Preparing for Normal Production by June

#### Confirmation of Sale by Chrysler Mark for Activity in Detroit Organization

DETROIT, May 19—Activity in the local Maxwell-Chalmers organization became apparent yesterday morning when news of the confirmation of sale of the Maxwell Motor Co. reached the plant in an official notice from Walter P. Chrysler, and preparations were immediately begun to put both the Maxwell and Chalmers plants on a production basis that is expected to reach close to normal by the middle of June. While President W. Ledyard Mitchell who remains as receiver until finally discharged by the federal court, is nominal head of the organization, A. E. Barker, general sales manager, is spokesman for Chrysler and the organization committee and as such virtually is in charge of the Detroit opera-

Barker said today no announcement would be made regarding the organization personnel until after a meeting of the new Maxwell Motor Co., recently incorporated in West Virginia, when officers and directors will be named and the company formally launched. Barker did say, however, despite the many rumors afloat that he would not be president and said the matter had never been suggested to him by Chrysler or any of the members of the reorganization committee.

#### Production Below Normal

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"Our production has been way down for several months and for some time there was no production at all," said Barker. "As a result of this we are facing a shortage of Maxwell and Chalmers cars, and our one idea now is to get things shaped up and get into production that will meet this demand. We are not concerning ourselves at this end with organization details or personnel, but are giving our whole time and attention to getting the factory into shape."

In confirming the sale and dismissing the petitions of R. R. Rogers and H. H. Webb who objected on behalf of themselves and other first preferred stockholders, Judge Tuttle gave attorneys two options, informing them that they would have to accept one or the other, as otherwise he would be compelled to grant the petition of the intervenors. One option was for placing in control of the court 180,000 shares of Class B stock of the new organization not already allotted, for the purpose of allocation to the intervenors, if it was found by the court that they were entitled to a greater share than is given them under the reorganization plan. The other option was for the committee to enter its appearance which practically is an assumption of liability for protection of the interests of the protesting stockholders if later developments prove they are entitled to further benefits. Attorneys for the reorganization committee after long distance communication with Chrysler and Harry Brunner of Blair & Co., New York, elected to accept the latter offer and entered appearance of the committee in the court records. Judge Tuttle thereupon confirmed the sale; H. Helfman and Hal Martin, Detroit attorneys for the protestants, intimated an appeal would be taken and this is reported as quite likely, though Nicholas Kelly of New York and L. M. Butzel, of Detroit, attorneys for the reorganization committee regarded the confirmation as final.

Under the reorganization plan the company gets \$15,000,000 new capital which will permit operation on a much firmer basis than ever before.

#### To Make Tour of Old Spanish Trail in Aid of Better Roads

New Orleans, May 19—An educational tour of the Old Spanish Trail will be made May 23, when several automobiles, laden with good-roads boosters, leave New Orleans, bound for Orange, Texas. The New Orleans Automobile Dealers' Association, the Motor League of Louisiana and the good roads bureau of the local association of commerce will send at least one car each, and seven individuals, interested in good roads, also have promised to send their cars.

The trip is a result of the suggestion of Harrall B. Ayres, managing director of the Old Spanish Trail, who is in New Orleans endeavoring to arouse interest in the least-developed and worst link in the coast-to-coast highway, through the state of Louisiana. Houma, Morgan City, Lafayette, Lake Charles and Vinton will be touched by the proposed trip and addresses on the trail will be made in each town. The road through Texas is virtually completed.

#### Guyot and Inghibert Reach New York for Indianapolis

New York, May 19—Two more foreign drivers to compete in the Indianapolis speedway race arrived Monday, these being Albert Guyot, and Louis Inghibert, who will drive Duesenberg cars. These drivers will also pilot the Duesenberg cars during the French Grand Prize race to be run July 25. Guyot recently won the road race over the tortuous course on the Island of Corsica in the Mediterranean.

Guyot reports that the automobile condition in France is very slow. Citroen is producing 50 cars a day, and is by far the most active of the French manufacturers. The Hispano-Suiza company is producing at the rate of 15 a month.

#### REINCORPORATE REES COMPANY

Columbus, May 20—The Rees Motor Co., Columbus, has been reincorporated with an authorized capital of \$300,000 to manufacture the Rees automobile, a two litre high-grade car weighing 1850 lbs. One of the exclusive features is the system of spring suspension. A specially designed carbureter is also feamerce. The changing conditions in the Rees, president of the company.

#### Stress Importance of Service At Factory Managers Meeting

#### No Policies Formulated at Convention But Numerous Valuable Suggestions Made

BUFFALO, May 18—Nearly one hundred factory service managers gathered at the Hotel Iroquois Tuesday, Wednesday and Thursday in the regular semi-annual convention conducted by the National Automobile Chamber of Commerce. The changing conditions in the automobile trade were reflected in the subject matter of the papers and in the discussions that followed. The realization that service is the one big thing today was forcibly brought home and, one after another, the speakers told of instances where good service had made sales and poor service had killed sales.

No new service policies were formulated at this convention and there was no agreement either to do or abstain from doing anything, but the good of the convention was largely in a great number of suggestions and hints, which all gathered together well repaid the delegates for the time and expense in attending the convention.

The somewhat dictatorial attitude of the factory toward the dealer had almost disappeared and the questions asked were not "What shall we allow this dealer?" but rather, "How can we meet the dealer on this particular question?"

While the car and truck owner were considered from many different angles, there seemed to be a tendency to get as much out of him as possible and give as little as possible.

In other words the idea of many seemed to be "Put on as much as the traffic will stand." This is not to be taken as the opinion of all the delegates, or even a majority of them, but there were enough expressions of this kind to make the idea stand out, especially on the question of parts prices and how many handling charges, profits, etc., could be loaded on them.

The convention was opened with an address of welcome by Col. Charles Clifton, president of the N. A. C. C. and president of the Pierce-Arrow Motor Car Co. He commended the delegates for their earnest desire to better conditions in the service end of the industry and said that Buffalo was glad to be host to the delegates.

Following this, H. R. Cobleigh, secretary of the service committee of the chamber read a report of the activities of the committee since the last convention held in Cleveland in the fall. A. B. Cumner, Autocar, chairman of the service committee presided.

In selecting the place for the next convention, St. Louis was suggested, but New York finally voted no with a recommendation that St. Louis be considered in the following spring. The time will be approximately Nov. 22 and the rooms of the N. A. C. C. will be used as headquarters

#### Ver Linden Will Leave Olds to Join Durant Organization

#### Company to Be Established in Lansing to Build Engines for New Car

DETROIT, May 19—Edward Ver Linden soon will retire from the presidency of the Olds Motor Works at Lansing to join forces with W. C. Durant, it has been learned here. His resignation has not been filed and no date has been fixed for his departure from the General Motors organization.

Details of Ver Linden's future plans are not obtainable but he will head a motor plant which will be established in Lansing to build engines for the Durant four cylinder car. The Durant car, at the beginning, will be largely an assembled product and it is probable Continental engines will be used until the production of engines begins at the Lansing plant. In the meantime the factory there will be used for assembling purposes.

Ver Linden resigned as superintendent of the Buick Motor Co. nine years ago to become works manager for Olds. years later he was made general manager and a short time later was promoted to the presidency. When he joined the Olds organization the output was 2.000 cars a year and the plant is now producing about 40,000 cars a year. The factory has been rebuilt and re-equipped under Ver Linden's management and more than \$12,000,000 has been expended in bringing it up to its present efficiency. The factory is equipped to build two new models and now has on hand orders sufficient to permit operations on a basis nearly normal for some time to come.

Under the management of Ver Linden, the Olds company frequently has led all other units of the General Motors organization and the car rivals Buick and Cadillac for popularity.

R. H. Collins has definitely severed connection with the Cadillac Motor Car Co. and is devoting his attention to the formation of the Collins Motor Car Co. R. H. Rice, has assumed complete direction of Cadillac affairs.

#### New Transport Engineer to Teach Distributors Service

Mt. Pleasant, Mich., May 19-E. A. Blake, for two years and a half connected with the experimental division of the company, has been appointed service engineer of the Transport Truck Co. His new duty will be in the nature of educational direction in the distributor organization. He will teach mechanics the quickest, easiest and best methods of locating trouble and making repairs, thus increasing the efficiency of the service department which subsequently will work a saving of time and money for the truck owner and spare him inconvenience.

In short, he will give a thorough course of instruction on the servicing of Transport trucks. Distributors will

be assisted in the installation of comprehensive systems of handling repair parts and the general operation of their service departments so that service can be rendered on the most intelligent and economical basis.

A considerable portion of his time will be devoted to giving salesmen a mechanical education from the selling angle. Mr. Blake expects to begin an immediate tour of the country visiting distributors.

#### Timken and Truck Makers Meet to Talk Over Service Problem

Detroit, May 19—More than two score manufacturers of assembled trucks in which products of the Timken Detroit Axle Co. are used responded to an invitation from Fred Glover, general manager of the Timken company, to attend a meeting here yesterday for a discussion of the unit parts servicing problem. The conference was called by Glover to obtain the views of the truck makers on this subject.

He informed them that his company, while desirous of giving the best service possible to the public, was anxious to adopt whatever plan was most satisfactory to the manufacturers themselves. Several of the manufacturers expressed their opinions on the subject but no decision was reached. One proposal was that a dealer "pool" of all parts be established in the hope of insuring service, rather than direct distributing depots maintained by parts manufacturers.

#### Orders Immediate Auction of Surplus War Trucks and Cars

Washington, May 19—An amendment of the army bill which passed the House Tuesday makes it obligatory by the Secretary of War to sell immediately at public auction or private sale all surplus motor trucks and passenger automobiles now in the possession of the war department. The provision in the present law authorizing the transfer of motor equipment to the Bureau of Public Roads was eliminated in the army appropriation bill.

Under the terms of the amendment the Secretary of War has no choice but to sell all the motor vehicles on hand beyond those necessary for an army of 150,000 men. Auction sales of unserviceable automobiles and trucks have been held at camps by the Motor Transport Corps for the past two months. There will be another this week at South Amboy, N. J.

#### SENATE PASSES THEFT BILL

Washington, May 19—Senator Nelson's bill amending the "Act to punish transportation of stolen motor vehicles in interstate or foreign commerce" has passed the Senate without amendment. The amendment adds the word "embezzlement" so as to include not only cases where the automobile is stolen but as well cases of embezzlement. It relates to transportation of embezzled property in interstate, not in state commerce. It has been sent to the House for action.

#### Automotive Industry Return in South Discredits Doubters

#### May Business Surpasses April— Prospects Greater Than at Any Time in Year

N EW ORLEANS, May 23—The period of readjustment in the automotive industry in the territory supplied by local dealers and distributors seems to be nearing an end. May sales thus far have been greater for virtually every dealer here than they were during the first three weeks of April, while prospects were reported as more numerous than since June, 1920.

This steady improvement is due to a great extent to the recently devised cooperative sales plans for the cotton crop and the revival of the War Finance Board, with accompanying aid from it in disposing of the south's cotton in Europe. Two other considerable factors are the temporary tariff on sugar and the development of a better class of automobile salesmen.

Payments are much steadier and more regular and collections considerably easier than they have been since last year. Improvement in this regard also is shown in the country where conditions generally have been much slower to readjust themselves than in the cities. Improvement in collections has been so great that practically all the New Orleans dealers are taking their cars promptly out of the railroad warehouses, meeting their notes as they fall due and discounting some of their paper in advance. All this has put the dealers on a more independent footing and has considerable influence with the banks for some of the short-sighted bankers, it must be said were expressing themselves widely and freely as to the doubtful future of the automotive industry. All of these doubters have been discredited and cast out by the gain in this industry in the past sixty days in all southern states.

One of the greatest aids in this development, especially among the Louisiana dealers, has been the steady, consistent and encouraging work of the New Orleans Automobile Dealers Association.

#### Recommends Patrol System to Maintain Roads in Texas

Dallas, May 19—Efforts are being made to have Gov. Neff submit at the special session of the legislature in July a bill providing for a patrol system of road maintenance. This proposed law, introduced in the regular session by Senator T. W. Davidson of Marshall, was passed by the Senate, but was not taken up by the House.

A patrol system of road maintenance will save the people of Texas \$100,000,000,000, Senator Davidson told the Texas Cotton Ginners' Association at its annual convention here. Millions have been spent for good roads in the state, he said, but the roads are not good, for they deteriorate as fast as built,

#### Year's First National Tractor Demonstration at Fargo in June

#### Committee Also Decides To Hold Shows at Minneapolis and Kansas City

CHICAGO, May 20—The most radical step ever decided by manufacturers to establish the economic place of the tractor beyond dispute was taken by the national show and demonstration committee, tractor and thresher department of the National Implement & Vehicle Association, today which made provision for a contest between horses and tractors in field operations.

The committee decided to hold three demonstration of which the first is scheduled for Fargo, N. D., June 28, 29 and 30. Another demonstration will be held in the southwest and the third in the central west, time and location of each to be decided later.

#### Contest Will Be Unbiased

Two shows were also authorized; one for Minneapolis and the other for Kansas City, provided suitable quarters can be furnished, rent free; and provided also that all other suitable and satisfactory arrangements can be made between the local and national committees.

The innovation of the horse and tractor contest is of special interest and in order that the results of these comparative tests be unbiased, fair and convincing, it was resolved by the committee that "the observations and data for such records be taken by a committee composed of representatives from the American Society of Agricultural Engineers, from the state university either of the state where the demonstration is held or the university of any other state; from tractor manufacturers, from the Society of Automotive Engineers, from the Horse Association of America and from the U. S. Department of Agriculture."

As an inducement to secure the very best horse power available, it was decided to award suitable inducements to horse owners entering the contest and making the best records on the cost of preparing their land allotments.

The dollars and cents comparison between horse power and tractor power in plowing and preparing seed bed as provided in these demonstrations will not take into account some of the most vital considerations in successful tractor operation, especially belt work, but new rules are provided by the committee so that manufacture of belts and belt driven machinery of any kind, operated with a tractor are eligible to exhibit. It is expected that the educational work of belt operations will be among the most interesting features of the demonstrations.

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No individual records of tractor performances and no comparisons between individual tractors will be given out for publication by the committee in charge of the demonstration. Each tractor manufacturer, however, will be provided with the record of his own machines.

The only results made public will be averages.

In this connection rules will be made to cover such details as depth of plowing, speed, etc. Observers will watch the operations and note the performance of each tractor and averages will be secured from those qualifying under the rules. Also averages will be secured for those violating the rules and thereby failing to qualify though completing the work assigned to them. Finally the average of the best six tractor records will be taken from those qualifying.

This will bring out the very best horse performance and the best tractor performance and represent the respective merits of each form of power. It should be made clear, however, that it is not the intention of these demonstrations to convey the idea that the tractor is limited to field operations or that the horse is to be eliminated from the farm or that it is only a dollars and cents comparison between the horse and the tractor in plowing and preparing seed bed and seeding.

A manager was definitely decided upon by the committee and authority was gi-Finley P. Mount to negotiate for his services in managing both the demonstrations and the shows for this year.

#### Heavy Price Reductions Made in Overland and Willys-Knight

Detroit, May 20—Willys Overland and Willys Knight officials have announced price reductions effective June 1 constituting the second drop in Overland cars within the last year totaling 33 per cent from the price last summer. Open models now selling at \$895 are reduced to \$695, coupe from \$1,425 to \$1,000 and the sedan from \$1,475 to \$1,275. Willys Knight prices for the touring car are reduced from \$2,195 to \$1,895 and the same reduction is made on the roadster. The coupe was reduced from \$2,845 to \$2,250 and the sedan from \$2,945 to \$2,750.

The new price on Overlands is \$150 less than the lowest price for which this car ever sold. It is made possible according to John N. Willys by the sale of the car which already has passed the 140,000 mark and by the anticipation of the great saving through increased factory efficiency, manufacturing cost and increased volume.

"We have decided to anticipate every possible saving and are getting our prices at rock bottom June 1st," said Mr. Willys. "We are going the whole route right now. The price is one which we have long anticipated we might some day reach in Overlands and the car itself is better than ever. At present we will take a loss on every Overland we sell, but expect to make this up in increased volume and increased material saving."

Mr. Willys stated last week that there would be no immediate price reductions notwithstanding rumors which had been current for some time. It is understood that the decision to reduce prices was reached Wednesday.

#### American Made Trucks To Be Reimported By New York Firm

#### New Company Has Bought 3,000 Vehicles from Slough Trading Co. in London

N EW YORK, May 19—The Truck Co. of America has been organized by L. Mansbach of the Fidelity Motor Supply Co., I. Edward Roskam of the Roskam-Scott Co., and A. B. Nessing of New York and Morris Froelich of Chicago, to deal in American made motor trucks which will be reimported from England. It is understood the new company has purchased approximately 3,000 of these trucks from the Slough Trading Co., Ltd. of London which bought them from the British government.

The trucks, it is stated, will be sold at approximately 50 per cent of the list price. Among the makes included in the purchase are Pierce, Mack, Packard, White, Riker, Locomobile, Liberty, Peerless, F. W. D., Nash and G. M. C. In addition to the trucks the company proposes to import a large quantity of parts for replacement purposes and also accessories of American make.

The company proposes to offer dealer franchises throughout the country and to advertise extensively.

Roskam has been the New York representative of the Slough Trading Co. since it began reimportation of these trucks into the United States. The first large shipment was sent to the Pacific coast but the demand for them was not heavy. It is now believed that with general business conditions approaching a more normal basis there will be an increased demand for these trucks.

The company has leased a building with 45,000 sq. ft. of floor space on the ground floor in 56th street between 10th and 11th avenues as well as a warehouse with 35,000 feet of space and a three story office building in West 63rd street.

It is stated that the company will have an export department with representatives in various foreign countries to offer foreign buyers trucks in large quantities. An especial effort will be made in this country to develop business with road builders.

#### CARS SELL IN MASSACHUSETTS

Boston, May 19-People are buying cars. It is shown by the increased registration. Motor vehicle registration in Massachusetts have already passed the quarter-million mark and have established new high points, both in respect passenger cars and commercial vehicles. For the first four months of the year the number of vehicles registered is more than 21 per cent in excess of the same period of last year and the number plates of passenger cars are already above 200,000, a figure that was not reached until much later in the preceding year. At the present rate the registration figures will pass the total for the whole of 1920 before the middle of June.

#### Gasoline Price in California Takes Drop of 2 Cents a Gallon

#### Recent Increase in Production of Crude and Slackened Demand Assigned as Reasons

L OS ANGELES, May 19—The dark gent who formerly had his haunts in the woodpile is now being looked for in the California oil fields. This is because the official publication of the mining and oil industry, issued two days ago, told about the inability of refiners to accumulate gasoline for storage but this week the Standard Oil Co. announced a price reduction of 2 cents per gallon at retail. It is expected that the other companies will make a similar reduction as they followed the Standard when it put into effect last October an increase of from 24 to 27 cents.

The announcement of a gasoline price reduction is cheerful news to all consumers. Right here at the source of gasoline supplies the price has been higher for six months than in many other parts of the country. The law of supply and demand was assigned by the oil companies as the reason. At the same time huge stores were being exported. The price reduction is made at a time when the touring season is about to start and the demand will be greater than ever.

#### Increase in Production

The Standard Oil assigns as reasons for the reduction recent increase in production of crude oil and slackened demand. The company also announced a reduction of 25 cents a barrel for fuel oil and the field price the company will pay for all grades of crude has been cut the same amount. Two bills that would have levied a tax of 1 cent a gallon on gasoline were defeated at the recent session of the state legislature.

New York, May 19—Lower costs of transportation and a consequent reduced cost of doing business, are seen by motorists in the recent decline of Midcontinent from \$1.75 to \$1.50 a barrel, according to the National Automobile Chamber of Commerce.

"The drop in crude means falling gasoline prices," it says. "Standard Oil of Indiana has already reduced the price per gallon in the Middle West by 3 cents, and the tendency is toward general lower levels in all sections. In some states it is now at 22 cents a gallon.

"As 3,000,000 of the 9,000,000 motor vehicles in the country are owned by farmers and as 60 per cent of automobile mileage is for business purposes, the fuel prices have a direct bearing on the cost of doing business. The leadership of the oil companies in reducing prices is being hailed in motor circles as a basic move in reconstruction which will permit lowered costs of doing business.

"It is believed that lowered prices of steel, together with the downward movement in fuel, are leading to a stabilization of industry which will permit resumption of trade on a peace-time basis. No increase of prices in the fuel field is likely. The high levels of early 1920 were based on a demand temporarily in excess of supply. At present, however, many refineries are closing down for lack of business."

#### Cleveland Dealers Choose Peckham as New President

Cleveland, May 19—G. G. G. Peckham, head of the Ohio Buick Co., was elected president of the Cleveland Automobile Manufacturers' and Dealers' Association at the annual meeting of the organization held Wednesday, in the Hollenden Hotel. He succeeds R. J. Schmunk, of the Peerless Motor Car Co., who served two terms as president. Other officers are F. E. Stuyvesant, first vice-president; C. S. Carris, second vice-president; Fred H. Caley, secretary and R. J. Schmunk, treasurer.

Four directors were elected for new terms as follows: C. A. Forster, Packard Cleveland Co.; C. S. Carris, Carris Franklin Co.; H. L. Lance, Ohio Motor Sales Co., and Frank N. Sealand, Sealand Motor Co. O. C. Tyner, of the Jordan Ohio Co., was named to fill the unexpired term as director of A. R. Davis, deceased. In addition to all the foregoing named, the directors who continue in office are: Fred H. Caley, A. L. Englander, M. B. McLaughlin, G. G. G. Peckham, R. J. Schmunk, H. O. Secrest, F. E. Stuyvesant and T. H. Towell.

#### All Willys-Overland Employees Made Salesmen Under New Plan

Toledo, May 19-Announcement was made here this week that the Willys-Overland Co. expects to take care of its bank loans, due Nov. 1, under the extension agreement, by means of a large bond issue to be offered to the public. If such a plan is carried into effect, it probably will mean abandonment of the proposal made some time ago by the bankers interested for a consolidation in a new corporation of the Willys-Overland Co., the Willys Corp. and the other interests controlled by John N. Willys. Increased business recently has permitted substantial reductions in bank loans but they still run into many millions of dollars.

As a new means of increasing sales of Overland cars each of the 7000 employees in the plant here has been made a salesman under a new plan by which he is paid \$10 for each prospect reported which results in a sale before June 1.

#### PENNSYLVANIA HAS 515,000 CARS

Harrisburg, May 19—The State Highway Department has registered to May 11, 515,000 passenger cars and 48,000 trucks. The number of passenger cars and light trucks 'is within 6,000 of the whole total of 1920. Last year the license number 500,000 was not issued until late in the summer.

#### Loose Methods in Risk Taking Mean High Rates of Insurance

#### N. A. C. C. in Bulletin Says Companies Should Scrutinize Moral Hazard

N<sup>2W</sup> YORK, May 19—The insurance committee of the National Automobile Chamber of Commerce of which W. E. Metzger is chairman, has sent to its members a bulletin declaring that in its opinion the present high rates are due to the loose methods in accepting risks and that insurance companies "should scrutinize the moral hazard." The bulletin says:

"The cost of insurance to car and truck users has mounted steadily. In the belief that this is very largely due to loose methods on the part of insurance companies in accepting risks regardless of moral hazard we have taken the position, in public statements on this question, that underwriters should scrutinize the moral hazard, and that in the meantime mutual insurance companies which cover the public at much less cost are to be encouraged.

"Accidents are not prevented by liability insurance, which, on the other hand, tends to promote recklessness. The amount of fire and theft coverage allowed on cars and trucks, particularly after the first year of their use, frequently exceeds actual value; this minimizes care and encourages their being destroyed and reported as stolen by unscrupulous owners. These costs are spread over the policies of the great majority of responsible owners.

"The new plan of grouping cars according to construction features determines comparative rates but can have little effect on total fire losses, since a very small proportion occur from integral causes. It does not go to the main point of reducing total costs to the public, which is of direct interest to manufacturers.

"According to figures given out by 131 companies, the fire and theft premiums received by them in 1920 amounted to \$74,472,250. The losses paid amounted to \$42,935,748. The proportion of these losses that went to reimburse unscrupulous owners was undoubtedly large.

While manufacturers are carefully studying the schedule of hazards of the Underwriters' Laboratories in which are listed features of construction considered by underwriters to have a bearing on risk, we are presenting the point of view that while this may be helpful, it offers little hope of any great reduction in the average insurance premium per car."

#### PLACES CHARGE ON RETURNS

Chicago, May 19—The Midwest Rubber Mfgrs. Assn. at its meeting here adopted a resolution recommending that a minimum charge of 5 per cent be imposed on merchandise returned for credit or exchange or on shipment of new goods.

#### Senate Finance Committee Hears Taxation Arguments

Industrys' Attitude Toward Proposed Program Outlined by Representatives of N. A. C. C.

(Concluded from page 23)

forms its functions more cheaply than the horse-drawn vehicle. In reality the haulage of farm produce by motor trucks is cheaper than haulage by team.

#### PAYING FOR ALL ROAD WEAR

Furthermore, Graham insisted that "A tax on motor cars or motor trücks is not a tax on luxury. It is a tax on transportation and a tax on the income and limited finances of the comparatively poor. It is right to reach the profits of the automobile manufacturer through the same taxes that apply to other kinds of business. We now accept without complaint state automobile taxes sufficlent to keep all roads in repair. Thus we pay not only for the damage we inflict, but for the wear and tear of all vehicles.

Further we should not be called upon to go, We cheerfully welcome our share of tax burdens, but we ask that we be rated with other industries, and that we be not placed in a branded classification and made to bear a kind of special and discriminatory taxes from which other less essential businesses are exempted."

Summarizing the situation, Graham stated that he did not feel that the record of utility warranted the including of automobiles in the luxury tax.

C. C. Hanch, chairman of the N. A. C. C. taxation committee, opened the argument for the industry. He outlined the recommendations of the organization, emphasizing the need for economy in governmental expenditures. His suggestion that Federal expenditures be held to \$2,000,000,000 annually was well received. Senator Penrose, chairman of the committee, inquired of Senator Smoot, ranking Republican member of the senate appropriations committee, whether this was possible under existing conditions. Senator Smoot answered that they could not possibly reduce expenditures to \$2,000,000,000 and take care of the proposed soldiers' bonus. Hanch found many sympathizers on the committee and suggested that "it is time for at least a brief naval and miltary vacation."

#### CUT TAXES DURING RECONSTRUC-TION

The committee questioned Hanch closely as to the effect of the excess-profits tax. His assertion that there was a vast preponderance of public opinion for the repeal was questioned by Senator Mc-Cumber, who contended that the farmeds did not want it repealed. Responding to a question of Senator Simmons, Hanch insisted that the excess-profits tax was a consumption tax in the last analysis. Senator Penrose wanted to know of the discriminatory effect of such tax as had been alleged by the automotive industry. Hanch said it discriminat-

ed against conservatively financed insti- Tax on Motor Fuel Will Aid tutions and favored extravagantly managed concerns, put a limit on initiative and was extremely uncertain of return. He furthermore insisted that it was unfair in principle as was true of the ex-

Haiich emphasized the need for lessening the tax burden on industry, particularly during the reconstruction period. He expressed the opinion that no additional burdens would be required before 1923, provided the Government was prudently conducted and a tight rein kept on expenditures. He endorsed the sales tax only in the event that additional revenue is needed and is placed on all industry.

Hearings on the Internal Revenue revision will be continued for several weeks in order that the committee may ascertain the views of the country on this problem which vitally effects all.

The House Committee on Ways and Means undoubtedly will take up this matter after the tariff measure is reported, probably by May 26.

#### STRAIGHT-8 RACE ENGINE POPULAR (Concluded from page 19)

goes through the crankcase and out of the rear breather which has an inverted tube facing downward in a compartment separated from the crankcase proper with a port entering the chamber at the ton and also one at the hottom. The breather tube in this chamber is scaled at the top and has a series of staggered holes down its side. It was designed to take as much air as possible from the crankcase and condense the oil vapor at the same time.

The crankshaft in this engine is quite heavy weighing about 165 lb. The pistons are 21/2 in. long, 31/8 in. in diameter and have two cast iron rings 1/8 in. square. The valves in this engine have a diameter of 1 7/16 in, in the clear and a lift of 7/16 in. There are four valves per cylinder. The engine on the dynamometer delivered 86 hp. at 3200 r.p.m. This it is said is not as high as that obtained from some of the eight cylinder engines of the same piston displacement.

On a test under wide open throttle this engine delivered an average of 78 hp. for one hour at 3200 r.p.m. During this trial the engine had a gasoline consumption of .625 lb. per hp. hour. This same engine ran 500 miles on the Indianapolis at an average speed of 88.7 miles per hour with an average of 10 miles per gallon of gasoline.

The oil consumption in the race was very high. This was due no doubt to the arrangement of the camshaft and because the valve mechanism was exposed. The racing car engine as a general thing seems to throw a great deal of oil and this especially might be true of this type of engine where the breather is very large and the cam housing is overhead.

ALL CADILLAC PLANT NOT SOLD Detroit, May 19-R. H. Collins has purchased only the main building of the old Cadillac factory here and not the entire plant as announced last week. The various other buildings are retained by the General Motors Corp.

#### Secondary Roads in Illinois

#### Bill Before Legislature Imposes Tax of One Cent a Gallon on Licensed Dealers

SPRINGFIELD, May 19-Secondary roads, those used for the most part by farmers, will be benefited through the passage of a bill now before the Illinois House imposing a cent tax on every gallon of motor fuel, which is defined in the bill as "all volatile and inflammable liquids produced or compounded for operating motor vehicles, such as gasoline, distillate, naphtha and liberty fuel." It does not include kerosene oil.

The bill, which is a substitute for one introduced in the legislature at an earlier date, provides that all persons selling motor fuel shall be licensed by the Secretary of State and that they shall make a return to the secretary during the first ten days of the months of the amount of motor uel bought and sold during the preceding month. With the return must be paid the license tax for the period covered by the return. Every licensee is required to keep records and books showing the business transacted. Authority is given the secretary for the appointment of inspectors to audit the books.

All money received by the secretary from these taxes, the law provides, "shall be deposited in the special fund in the state treasury known as the secondary road fund and appropriations shall be made from that fund only for the purpose of paying the state's share for the construction or improvement of stateaid roads with gravel, crushed rock or macadam; provided, however, that until July 1, 1925, the whole or any part of the secondary road fund shall be available for the construction of any type of roads in the state."

#### DISTRIBUTORS REORGANIZE

Portland, Ore., May 19-Reorganization of the Cook & Gill Co., Paige distributors for Oregon, was effected this week, Fred A. Cook and Charles B. Harris, two members of the old firm purchasing the interests of W. A. Gill and H. W. Lyon. Mr. Cook, one of the new partners, was the originator of the firm and has been active in its development since the first, while Mr. Harris until a year and a half ago, when he joined the company, was district manager in the Pacific northwest for the Paige-Detroit Company. The company will continue to operate on the same general policy as in the past.

#### TUBE PATENT SUSTAINED

Chicago, May 20-Judge Killets in Federal District Court has handed down a decision sustaining patent 1,034,954 held by the Dallas Brass & Copper Co. on their lock seam tube forming machine in a suit against the Motor Products Corp. and the Diamond Mfg. Co. of Detroit.

#### Threatened Legislation Influencing Truck Sales

#### Registrations for April in Southern California Show Pronounced Decline Over March

L OS ANGELES, May 19—Reports of new passenger car sales made during April, 1921, show 4,131 as against 2,793 sales for the same month a year ago in southern California. The total registrations for the first four months of the year were 13,811, an increase of 67 over the same period in 1920. In addition there have been registered 86 new cars of miscellaneous makes not included in the above total. In Los Angeles county during the month there were 2,894 registrations and 9,576 for the four months, or 895 more than last year. The following makes of cars were the leaders during the month: Ford, 2,067; Studebaker, 332; Chevrolet, 219; Buick, 185; Oldsmobile, 121. In reporting the total registrations in southern California for March, the figure 6,259 was given. This should have been 5,729 and the Studebaker should have been credited with 445 instead of 345.

Truck registrations showed a very pronounced decline over March. In April there were but 464 registrations, including 222 Fords, as against 747 registrations for March. By many dealers, fear of threatened legislation, which would have affected trucks seriously, is assigned as the chief reason for the slump in business. There has been a noticeable decline in the demand for trucks in the outlying districts.

Dealers here refuse to commit themselves to an opinion upon the effect of announcements of price reductions upon the automobile sales conditions. One point upon which all agree and none is reluctant about expressing an opinion is that the used car business is again in a state of turmoil. One dealer is reported to have said the price reductions announced within the past two weeks have cost him \$10,000 in shrinkage in used car values. It is too early now to hazard a prediction as to the stimulus that will result in increased sales of those cars prices of which have been reduced.

The appointment of a receiver for the Al G. Faulkner Co., California distributor of the Marmon no doubt will have its effect upon the entire passenger car industry in this state. The Faulkner company was placed in the hands of a receiver upon the petition of the Nordyke & Marmon Co., which is said to have claims against the dealer amounting to \$150,000. The Faulkner Co. has been operating on a large scale throughout the state. Two large establishments have been maintained here and another in San Francisco.

#### MORE SHIPMENTS IN APRIL

New York, May 20—Figures compiled by the National Automobile Chamber of Commerce show that shipments of automobiles in April, exclusive of Fords, increased 27 per cent over March. Laşt year April decreased 23 per cent under March. Shipments from 50 factories indicate that the April total will be 20,000 carloads, 13,800 drive-aways and 1,134 shipped by boat. This is 71 per cent of the shipments in April, 1920.

While the railroads carried more automobile shipments in April of this year than last year, because of the lack of car supply and strikes, the difference in production is accounted for in drive-aways.

#### Former Plant of Cadillac in Detroit Is Bought by Collins

Detroit, May 20—R. H. Collins, who retired from the presidency of the Cadillac division of the General Motors Corp. to head the Collins Motor Car Co., a \$10,000,000 Michigan corporation, has purchased the Cass avenue plant occupied by Cadillac before that company moved to its new location. Negotiations for the purchase were closed Tuesday and Collins took possession.

Collins states it is too early to make any announcement regarding the type of car he expects to build beyond the fact that it will be a high grade automobile which is expected to be in production by Jan. 1. He will not begin work at his own plant until he finally severs his relations with Cadillac July 1. He still is in full charge of the General Motors company and will continue until that date. He declined to state the price of the property.

Collins will be allied in his new venture with W. C. Durant who is at the head of Durant Motors, Inc. An early announcement is expected from Durant regarding the location of the main plant for the production of his car. It undoubtedly will be located in the Detroit district, however.

#### ERIE PRESIDENT GUILTY

Toledo, May 20—Peter F. Wills, president of the Erie Tire & Rubber Co., was found guilty of embezzlement of \$29,793 of his company's property by a jury in common pleas court at Sandusky. The indictment returned against him last December charges him with having embezzled \$41,886 in personal property of the tire company. The company recently went into hands of the receivers. There are stockholders in most of the towns in southern Michigan and northwestern Ohio.

#### DOUGLAS CROW SHOT; DIES

Houston, May 19—Douglas Crow, member of the firm of Crow Brothers, well known in automobile circles here and former Franklin dealer, died Monday night from the effects of bullet wounds received earlier in the day at the hands of Rice C. Russell, his brother-in-law. Mr. Crow had been in the automobile business in Houston for many years and until recently the firm of which he was a member had handled the Franklin in this city for a long time. A surviving brother is Binz Crow, who recently won an endurance race at Montevideo, Uruguay.

#### Graham Speaks to Senators in Support of Townsend Bill

#### Pleads for Concentration of Federal Funds on Main Arteries of Trade

WASHINGTON, May 19—George M. Graham, vice-president of the Pierce-Arrow Motor Car Co., and a member of the highways committee of the N. A. C. C., opened the campaign of the automobile manufacturer, dealer and owner for an adequate highway system when he appeared before the Senate committee on Post Offices and Post Roads this week in advocacy of the Townsend bill. He insisted that it was essential that roads of primary interstate importance should be selected and there should be concentration of Federal funds in conjunction with state funds.

Mr. Graham impressed the committee with the fact that the farmer more than any other class benefitted by interstate roads of a permanent character. A group of organized farmers, the American Farm Bureau Federation, is opposed to the Townsend bill because it fails to provide for a system of farm-to-market roads. The spokesman for the chamber showed the tremendous expense and almost insurmountable difficulties which beset such a vast program. Prof. Atkeson of the National Grange testified that a large majority of farmers were in favor of the principles contained in the proposed legislation as they were convinced that it was the best system possible under existing conditions. He told the committee that the farmers would reap more advantages from a system of interstate roads than any other class because it would open markets for farm products far beyond state frontiers.

#### Would Reduce Freight Cost

Discussing the important features of highway maintenance, Mr. Graham informed the senators that it was the duty of the state to provide the upkeep of the highways and develop secondary systems when the tariff becomes too heavy for the main arteries of trade.

As to the increasing dependence upon the highways for transportation, Mr. Graham stated that the extension of highway systems would do much toward reducing freight costs. He declared that new and properly constructed highways were required immediately to meet the demands of commerce, and stated that a Federal highway commission would be the ideal body to supervise work of national scope. He expressed the opinion that such correlation and coordination would be possible only under a commission form as provided in the proposed Townsend bill. He suggested that it would be well to construct and maintain roads through the public domain at Federal expense except, of course, where states contain large areas of Federal lands when due modification should be made of the present 50-50 expenditure of national and state funds.

#### Concerning Men You Know

William J. Dieman, formerly connected with the Elgin Motor Car Co., has become associated with the Koehler-Rahn Auto Co., Milwaukee, as sales-manager. The Koehler-Rahn company is distributor of the Elgin and the National in Wisconsin and Upper Michigan, and is retail dealer in Milwaukee and vicinity for both lines.

wisconsin and Opper Michigan, and is retailed realer in Milwaukee and vicinity for both lines.

Julian D. Sargeut, for nine years a member of the sales department of The Chain Belt Co., Milwaukee, has resigned to become connected with the Reeke-Nash Co., Milwaukee, as assistant to R. W. Kinsey, sales manager.

George H. Scott has resigned as vice-president and general manager of the E. W. Clark Motor Co., Milwaukee, Wis., distributor of the Chalmers and Maxwell and the Doris. Mr. Scott has organized a new corporation known as the Geo. H. Scott Motor Co. of Fond du Lac, Wis., to engage in the distributing and retailing of automotive vehicles and equipment.

E. C. Verbeck, Milwaukee, has been appointed representative of the Wills-St. Claire in Milwaukee and vicinity.

Frederick P. Nehrbas, who has been associated

Frederick P. Nehrbas, who has been associated with the industry since 1900, has become associated with George A. Weidley as works manager of the Weidley Motors Co. of Indianapolis. Mr. Nehrbas' latest connection was with the Premier Motor Car Co.

Premier Motor Car Co.

R. C. Reichel, who has been in charge of factory service for the Chalmers, has been appointed service manager for both the Maxwell and the Chalmers. A. E. Richmond, for several years handling Maxwell service at the factory, has been named supervisor of the San Francisco district for Maxwell-Chalmers. E. E. Thompson, former chief inspector for Maxwell-Chalmers, has been selected special sales supervisor for the companies with temporary head-quarters at Detroit. Theodore Koerner has been named superintendent of inspection having charge of inspection in all Maxwell-Chalmers plants.

Leonard Vandersall, for over seven years con nected with the Maxwell and Chalmers companies, has been appointed South African specia representative for Maxwell-Chalmers export de

Joseph Tallmadge, former sales manager of the Handley-Knight Co., Boston, has been appointed wholesale sales manager of the Boston Oldsmobile Co.

mobile Co.

Richard F. Carlson has been appointed manager of the northern division of the Walter M.

Murphy Motors Co., San Francisco, Pacific coast distributor of the Lincoln car.

S. S. Jenkins, formerly district manager for the Bijur Motor Appliance Co., at Detroit, has been appointed general sales manager of this

concern, with headquarters at Hoboken, N. J.

P. J. Eubanks, for the past two years chief engineer and manager of the Aero Products Co., Cleveland, has resigned to devote his entire time to the duties of chief engineer of the consulting engineering firm of Rush & Eubanks, Cleveland.

Norman Elliott has resigned as secretary, in large of sales and advertising of the General op Co., manufacturer of Arteraft Tops, Cleve-

Gerrit P. Judd, until recently salesmanager for the Lafayette-Philadelphia Co., has joined the sales department of the Neel-Cadillac Co., Phila-delphia. H. H. Davy, formerly selling for Herbert Bros., also has joined the force of the Neel-Cadillac Co.

D. C. Paul, formerly with Gaul, Derr & Shearer Co. of Philadelphia, has been placed in charge of the Pittsburgh branch of the Black & Decker Mfg. Co., covering western New York, western Pennsylvania and the northern part of West Virginia. He is assisted by Frank E. Marrion and J. A. Miller. part of West E. Marrion

Milton M. Morgan, formerly associated with the Tri-State Motors Co., Charleston, W. Va., is resident of the Wheeling Motors Corp., a reently formed organization to take over the gency of the Columbia Six previously held by agency of the Columbia the Tri-State company.

J. F. Lynch, for some time sales manager of the Dort Motor Co. of Oklahoma City, has joined the sales force of the Kardell Motor Car Co. of St. Louis.

Charles Lightfoot, former secretary of the Schlecht Motor Car Co., St. Louis, has become connected with the sales force of the St. Louis Motor Car Co.

Charles Borghoff, former service manager of the Tate Motor Car Co., is now associated with the selling organization of the Briscoe Motor Car Co. of St. Louis.

R. Henry, former wholesale manager of the St. Louis Overland distributing center, has been appointed sales manager of the Hudson-Frampton Co. of St. Louis.

ton Co. of St. Louis.

Louis E. Clarke, who for several years has been connected with the manufacturing department of the Hoyt Metal Co. both in the east and the middle west, has been appointed salesmanager of the babbitt-lined bronze bushing and die casting departments with offices in the Boatmen's bank building, St. Louis.

W. E. Green has been appointed manager of the Foreman-King Co., Columbia, S. C. He was formerly connected with the company at Charlotte, N. C.

responsible manufacturers upon reason-

Had it been decided to exclude others from the use of the inventions in question the results to the industry might, in view of the importance of the patents involved, have been of a serious nature, creating much confusion in the bumper trade.

CHARLOTTE ELECTS WALLACE

Charlotte, N. C., May 21-Ed M. Wallace of the Southern Oakland Co. has been elected president of the Charlotte Automotive Trades Association for the new year. J. P. Harris of the Burwell-Walker Co. is vice-president and W. M. Jones secretary-treasurer, a position which he has held for the last year. Election of the board of directors resulted as follows: Lane Etheridge of the Pyramid Motor Co., Tom Glasgow of the Komo Supply Co., Lee A. Folger of the C. C. Coddington Co., and Wade H. Montgomery of the Carolina Auto Supply House.

TO COMBINE TIRE FACTORIES

New York, May 20-J. V. Mowe, general sales manager of the Kelly-Springfield Tire Co., who has returned from the formal opening of the company's new \$11,000,000 plant at Cumberland, Md., announces that the 12 acres of manufacturing space now available in the new factory will make it possible to combine the Buffalo-Worcester and Akron factories in one plant thereby producing cord and fabric casings, tubes and solid truck tires on a scale which the company never before has been able to approach. The immense new plant is said in some respects to be the finest in the world. Cumberland was selected because of its strategic location for the distribution of tires, the shipment of crude rubber from near by ports, the proximity of the West Virginia coal fields and the favorable labor situation.

Post and Whitney Tractor Companies in Consolidation

Cleveland, May 20-The Post Tractor Co. of this city and the Whitney Tractor Co. of Upper Sandusky, Ohio, have been consolidated under the name of the Post-Whitney Co. This company which is capitalized at \$10,000,000 is headed by C. P. Cassatt of this city. The other officers are: Vice-president, A. B. Whitney, Upper Sandusky; treasurer, C. B. Post, New London, Ohio; secretary, F. R. LePage, Cleveland. The officers with Ralph Blue and A. H. Weiblem of Cleveland constitute the board of directors.

The company will maintain the plant at Cleveland where the Post tractor will be manufactured and the Whitney plant in Upper Sandusky where the Whitney tractor is being built. An announcement is expected soon regarding the purchase of an engine plant in which engines and transmissions will be built. The Whitney tractor has been manufactured for several years and is of two cylinders. four wheel, two-plow size. The Post tractor has been in process of development for some time and is now being put into production. It has both a front and rear drive and is of three-plow size. An extensive sales campaign, both domestic and foreign, is being made for this tractor.

DEALERS PLANNING PICNIC

Columbus, Ind., May 20-Plans are being made by the Columbus Auto Trade Association for the construction of an auditorium to be built at the fairgrounds here in which the association can give its annual shows during the time of the fair. Heretofore the dealers have been compelled to use tents as shelters. The association is planning to hold a big picnic near this city June 2.

OHIO ROADS GET 34 TRACTORS

Columbus, May 20-Tractors have been added to the war department equipment furnished to the Ohio state highway department for road building and repair. The allotment for this state is 34 tractors, of which 18 are of caterpillar construction. By a ruling of the federal department of agriculture which has charge of the equipment the tractors can be used only on federal road improvement jobs. Strictly state work must be done by tractors purchased for that

American Chain Gets Control of Important Bumper Patents

Bridgeport, Conn., May 21 — The American Chain Co. has entered the bumper field and has acquired ownership or control of the Hoover and Fageol patents which cover bumpers of the spring steel type as well as the Pancoast and Grotenhuis patents of the Biflex type covering bumpers having between the ends of the bumper bar a widened impact portion in front of the radiator,

Licenses under all three groups of patents have been granted to the following companies: C. G. Spring Bumper Co., succeeding U.S. Auto Bumper Co. and Kalamazoo Spring & Axle Co., Chicago, Ill., L. P. Halladay Co., Streator, Ill.; Biflex Products Co., Waukegan, Ill.; New Era Spring & Specialty Co., Grand Rapids, Mich.; and Gemco Mfg. Co., Milwaukee. Wis.

These companies are authorized to use the inventions covered by these patents in bumpers made and sold by them. The American Chain Co., while, it is said, intends energetically to enforce its rights against infringers, has adopted a liberal policy of granting licenses generally to

## How the Electric System Works



Article VII

By A. H. PACKER

A Short Series of Articles Wherein Is Given the Fundamentals Underlying the Operation of the Modern Electric System as Applied to Automotive Apparatus

BY the time I had packed all of my camping equipment in the back of the car it was three o'clock and I should have been on my way by one, so when the starter refused to work I cranked up and was soon out on the road to Westville where I intended to put up for the night. As I drove along I began to wonder just what sort of trouble had out my starter out of commission, but I did not have long to think about it for it soon got dark.

As I turned on my lights, there was one brilliant light, the road was bright as day, then all was dark again, and I knew then what had queered the starter. A connection on the battery had either become badly corroded or else broken completely off, so that the starter could not get current from the battery, nor could the generator send charging current to the battery, and with no current output to regulate its voltage it had burnt out my lights as soon as I turned them on.

As good luck would have it I had some oil in my side lamps and managed to feel my way in to Westville with the help of their feeble rays, and with a good trouble job for the red head to figure out for me. As I drove in to the garage he wanted to know if I had invested in some oil well, and was trying to create a market for the produce by burning "That's all right, Son," I replied, "Just show me the way to some feed, and tomorrow I will show you what is wrong with all the lights, and how they happened to get that way." So the next morning we were on the job bright and early, at least we were both early, and I began to show him a few things about generator regulation and the way it is taken care of on the car.

In Fig. 1 is indicated a generator armature revolving between field poles and with brushes "B-1" and "B-2" (shown dotted) in the neutral plane or middle position in which they would be located in order to have the greatest voltage between them. As the generator begins to send out current, we find with the right hand rule that current will flow in toward the paper under the "N" field pole which direction we will represent by the conductors being shown solid black, while under the "S" pole the current will be coming out from the paper.

Instead of the armature action let us look for a minute at the magnetizing

Fig.1

B 1

B 3

Fig.1

B 3

Fig.1

B 3

Fig.1

Fig

Fig. 1—Here is shown a generator armature placed between north and south poles with the conductors cutting the lines of force from the poles

action of the armature current and to do this we can consider that the wires in slots 1 and 2 are the sides of a coil, that 3 and 4 form another coil, 5 and 6 form another coil and so on. The combined effect of the armature current is, therefore, to make a magnet out of the armature core with its "N" pole and "S" pole as indicated in Fig. 1.

As the field magnetism sends lines of force to the armature, they will now be twisted or distorted by the magnetic effect of the armature current, and will

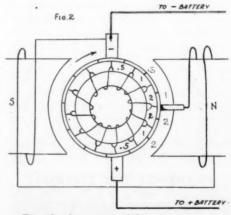


Fig. 2—Lay out of brush arrangement on a third brush generator

tend to enter at the "S" pole of the armature, which will give these lines the general direction shown in Fig. 1. To get the brushes in the neutral plane will now require a shift to the position shown in solid lines and indicated by "B-3" and "B-4" which position is required for minimum sparking at the contact of the brushes and commutator.

As the brushes are moved to their new location, the current in the armature will be affected and the wire in slot No. 1 will carry current in the same direction as numbers 2, 4, 6, etc., while the current in No. 18 also reverses.

With the shift in current in these two coils, the location of the "N" and "S" poles of the armature will also change so as to be in line with the brushes shown in solid lines and the armature will now have two magnetic effects, one a cross magnetizing action and the other demagnetizing action which will slightly oppose the effect of the field in sending lines of force through the armature. This general action while tending to regulate the output of generators at high engine speed is not enough to prevent a machine over-charging a battery and over-heating itself so that other methods must be used.

To understand the methods of regulation we must consider the things that affect the generated voltage. These are two in number after the generator has been built, that is strength of field which determines the number of lines of force that are cut when a wire on the armature goes past a field pole and the other thing is the speed of the generator, which determines how many times per minute or second the wire will return and again cut through these lines of force.

With an engine constantly changing its speed with every change in car speed, it appears that an increased output will be obtained at the higher speeds unless this increase can be neutralized by weakening the strength of the magnetic-field, and with very few exceptions, this is the method employed.

The principle of field distortion illustrated in Fig. 1 is used in the third brush type of generator, the action of which is illustrated in Fig. 2. Here for purposes of illustration a ring wound armature is shown with leads from each coil to commutator bars and two large brushes resting on the commutator, carrying current to the battery. Instead

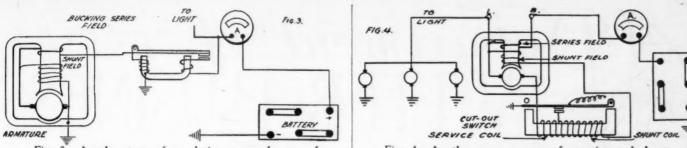


Fig. 3—Another type of regulation means by use of a bucking series field. In this type of machine the series fiel dopposes the action of the shunt field

Fig. 4—Another arrangement of a series and shunt field generator in which the battery current is taken from the series field

of the field windings being connected to these main brushes, however, they are connected to one main brush and the third brush which is located in between the other brushes.

We will now consider the conditions that produce voltage in the armature and how this voltage affects the current output. First we know that voltage is due to the armature wires cutting lines of force, so that the wires that are moving under the "N" or "S" poles are generating a little voltage, while those under the main brushes are moving along, not across the lines of force and, therefore, are generating no voltage.

With no current flowing in the armature, the voltage conditions are approximately indicated by the black figures which show that two coils right under the "N" pole are each producing 2 volts, the next coils which are under the edge of the pole are each showing 1 volt while the other coils show .5 volts, giving a total of 7 volts across the main brushes and 3½ across the field winding. This is about the condition required at a car speed of 10 m.p.h. at which the cutout should close connecting the generator to the battery.

With increase in speed after the cutout points have closed, the charging current to the battery increases, and in passing through the armature, produces the magnetic distortion described in Fig. With this distortion the location of the coils that generate the greatest voltage will also change and the new voltage conditions will be approximately shown by the dotted figures. These indicate that the voltage across the field has been greatly reduced being about 11/2 instead of 31/2 because the coils from which the field has been getting its voltage have been robbed of magnetic flux by the shifting of the magnetism to the other side of the third brush.

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This weakening of the field with increase of current results in the generator having a certain output peak above which the current does not go with increase in speed. This peak is moreover adjustable by adjusting the position of the third brush, for rocking it with the direction of the armature rotation will increase the voltage of the field while rocking it against rotation will lower the output. This type of generator on account of its simplicity both as to construction and operation is becoming more and more popular and is the type of machine used on the Ford car.

We will now consider the effect of running the machine with the battery disconnected. Assuming that the generated pressure is 7 volts at 19 m.p.h. and that the speed should be doubled, that is increased to 20 m.p.h., we would have 14 volts if we consider that the field strength remains the same. This increased pressure will, however, double the current in the field windings and again double the voltage, which will again increase the field current and hence the voltage will again rise. There is then apparently no limit to the voltage that may be obtained when a generator is disconnected from the battery and run at high speed.

The fact that the iron eventually be-

THROUGH CUT-OUT
TO BRITTERY A
POINTS

FIELD

NERRY ING TYPE
VOLTAGE REGULATOR.

Fig. 5—This shows a vibrating type voltage regulator in which the field current is caused to pass through a a resistance winding intermittently

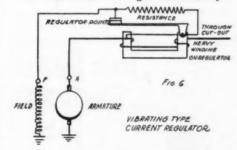


Fig. 6—Another type of shunt field vibrating regulator is indicated above. In this instrument the magnetic action is secured by the current passing through a very heavy series coil

comes magnetically saturated limits the voltage rise at some point but not before some damage has been done, for the writer has personally seen a 6 volt generator rise to 40 volts when the battery was disconnected, and higher voltages than this are easily possible. The effect of 40 volts on 6 volt lights is readily appreciated, for they burn out in a flash, and if a machine is run for any length of time in this condition, the abnormal current in the fields will burn them out, and the heat in the armature and trans-

mitted to it will probably ruin the armature as well.

If it ever becomes necessary to run a car with the battery disconnected or removed, which is possible on a magneto equipped car, care should be taken to protect the generator from burning out. There are several ways of doing this, one being to short out the generator, or with a single wire system to ground it. In Fig. 2 this would correspond to connecting a wire across the two main brushes while on a Ford generator a wire from the main terminal (not the cutout terminal) to one of the end bracket screws would accomplish the same result.

The effect of such a connection is to allow some current to flow but the amount is very small, and the difference in voltage between the two main brushes is very small. As the field voltage is only half of the main voltage, the fields never have a chance to become magnetized to any extent, and in fact will often become demagnetized by the armature current. This does no permanent harm as they can be quickly remagnetized by closing the cutout by hand after the battery has again been installed on the car.

Another possible way to prevent the generator from operating is to remove the field fuse, if one is used on the machine, or else raise or disconnect the third brush. If a main brush is raised in a third brush machine, care must be observed in order to get the right brush. In Fig. 2, for example, the raising of the upper brush would open the field circuit while removing the lower brush from contact with the commutator would not prevent the negative brush and the third brush from sending excessive current through the windings and burning them In testing a third brush generator that has been repaired it is customary to send current through the armature only at first with third brush lifted.

If the armature tends to turn it shows the main brushes are not in the neutral position and they should then be shifted until armature current has no appreciable tendency to rotate the armature. A slight tendency to turn in the normal direction is sometimes considered permissible as it aids commutation and has a slight demagnetizing or regulating action when current flows to the battery. The next step is to set the third brush so that the generator charges the right amount which varies usually from 8 to 15 amp. depending on the size of the

(Continued on page 44)



A Dealer Who Staged a Show of His Own

you have some.

Every motor car dealer admits that the shows are wonderful things and a great boost for business, holding that they are great mediums of advertising and wishing they would occur oftener. They let it go at that.

Not so with one dealer in Scranton, Pa. He staged his own show. Here is how he did it.

Through some factory delays his orders had accumulated and finally he was notified that he was about to receive the full shipment, including a large variety of models. He immediately set to work and requested that each car in the shipment be left in his show room for the following week. This the owners readily agreed to do.

Advertising was this dealer's specialty. Newspapers, circulars and the telephone proclaimed the on-coming show. Also the sales organization was out in force. Monday morning found the showroom draped like a ball room. One of the cars was turned over with the crankcase removed for the mechanically inclined and the rest was brilliantly polished.

The show ran for the entire week and every prospect, good or indifferent, was invited to come in to look over the new cars and listen to a line of "ought to have a good car to take the family out in"

#### Telling the Prospects of Your Sales

The J. J. Jacobs Co., Studebaker agents in Sacramento, is displaying the figures "89" in large numerals on every window. This represents the number of cars sold last month, and is being used to turn the minds of prospective buyers to the car the company handles.

#### Making Them Talk About Your Car

Any passenger car that is peculiarly painted or that carries a sign of some sort always attracts a lot of attention. So it might be a good idea for the dealer to specially paint one of his stock cars every now and then and run this car up and down the main streets of his town. By doing this he would attract the attention of all the folks in the down-town district and make them say "There's So-

and-So's Runwell car." This would center the thoughts of many folks on the dealer and on the cars he sells. Or he might attract attention by having a sign painted like this-"Record-holding car. This city to Brampton and back, 66 miles in 81 minutes." A sign of this sort would make folks talk and also center their attention on the dealer and on his cars and would, therefore, help his busi-

#### The Car Owner Can Furnish Prospects

Every once in a while the dealer should get in touch with all the local owners of the cars he is selling and should ask them as to what prospects they could give the dealer. It is certain that out of all the owners the dealer would find some who knew of real prospects and who would be glad to give the names of these prospects to the dealer. In this way the dealer would be getting prospects with a minimum amount of trouble and would also be keeping in touch with present owners, which would be a good thing for business when it came time for the dealer to try and sell them new cars.



HERE'S a tip for Better
Business—wash your windows-A window washer is one of the best economies known-Clean windows cut the light bill, make your building more attractive and prevent accidents caused by dim surroundings in the repair shop-Do It Now.

#### Booklet on Traffic Rules Sells Accessories

Realizing that the average motorist has a very incomplete knowledge of his local traffic ordinances and laws, a garage doing a large business in accessories has published a booklet giving a very complete account of the more important rules. Advertising was scattered through the booklet at important points. After giving the ordinance requiring non-glare lenses in lights, the following words informed the motorists that: OUR LENSES FOR HEADLIGHTS FULFILL THESE REQUIREMENTS. The books were in great demand and acquainted the motoring public, not only with city and state traffic rules, but with the line of accessories carried by the garage.

#### Summer Offers Advertising Opportunity

One of the best places for a dealer to do advertising in the summer time is at the dance halls near his home town. At such parks or dance halls he ought to put up signs like this: "Get more joy by riding to and from this dance hall in a new Blank car. See Smith, the local Blank dealer." Out of all he young men patronizing the dance half it is certain that some could afford a car and such a sign would help the dealer get in touch with them. It might also be a good plan to advertise that the dealer would take interested young men to and from the dance hall when special appointments were made. By keeping alert the dealer could keep away from those young men who would try to impose on him and could secure some good prospects by this

#### Make the Sales-Car Sell at Night

Many sparkplug salesmen have a large imitation plug mounted on their car which attracts considerable attention especially during the day. However. these cars are often driven around towns or cities during the evening when people have time to examine out of the ordinary exhibits but they fail to catch the eye at night. Why not rig up these plugs so they can be made to produce a large spark? Every one is interested in an electric spark and will stop to examine such a device.

#### Get to Know Neighbors in Your Block

If the dealer is located in the residence section of a city and not in "Automobile Row" he should see to it that a personal call is made on every person living in the block where he is located or doing business in that block. Of course everyone in the block will know about him and be interested in him and the dealer should cash in on this interest by such calls which might very easily lead to sales.

Reminds Customer to Change Oil

Eli Ackerman, owner of the North Edgewater Garage, Chicago, ties a small diamond shaped announcement on the speedometer of each car that comes into his place of business. On one side is the name of the garage and its telephone number. On the other side is printed "Speedometer reading on .

(the date the car was in the garage) was...... When your speedometer reads..... .....your crankcase oil should be changed." It is very probable when the mileage has been covered that the owner of the car will return to the garage which has furnished him with the reminder.

#### Making Your Show Windows Tell a Story

An Indiana tire dealer attracted much of extra attention to his window display by showing the cured hide of an alligator he had shot while on a trip to Florida and by showing a card with the hide reading as follows:

"OUR TIRES ARE TOUGHER THAN THIS ALLIGATOR SKIN.

"Our tires will stand wear and tear like this skin did and the alligator who wore this skin was twenty years old!

"This alligator was shot by our Mr. White while in Florida in January. Come in and let us talk to you about hunting alligators and about long-wear automobile tires."

#### Sells Seat Covers by Showing Them on Cars

Dealers who are not always as careful in the matter of window displays as they might be might pick up an idea or two from Horace Heisey, a Cincinnati dealer. Heisey is continually using his windows to the best advantage with attention-attracting displays, the latest of which is a Ford sedan with attractive seat covers in place. The actual appearance of the covers on a car seems to have an effect on car owners for he has materially boosted his sale of seat covers since the plan was instituted.

#### Keep in Touch with the New Generation

It is the case in every American city that men are coming up in the world every year. The young man who last year simply couldn't afford to buy a car, has this year a sufficient amount of money to enable him to buy a car and

The automotive industry, perhaps more than any other, has realized that under changed conditions salesmen must go out and get business and they have met with has demon-strated that there is business which an alert, forceful, aggressive and insistent salesman can get. The industry is leading the way back to normalcy through the dealer's and salesman's grasp of the situation. The day of the order taker in all lines of business gone and most dealer organiza-tions are alive to that fact. Every day in automobile selling there is additional evidence that real salesmanship is return-ing. Ding, in the Chicago Evening this characteristics of business. The characteristic control of th

the success

Maral: It Isn't the Public that Has Quit Spending So Much as It Is Business that Has Quit Selling.

pay cash for it. And for this reason the wise automobile dealer will keep in mighty close touch with the progressive and hard-working young business men in his city for the purpose of being on the job when these men are in the market for a car. Investigate the young business men in YOUR town. Some of these business men who, perhaps, have been considered lacking in money, have done so well in the past few months that they are now splendid automobile prospects. Get in touch with them and sell them cars at once.

#### Advertises Tires by Airplane

The Charles A. Fisher Co., Cincinnati dsitributor of Lee tires, has undertaken a novel method of advertising the tires.

Fisher, with his pilot, O. W. Pearson, formerly with the Canadian army, make daily flights to the towns within the radius of the Fisher company's territory, in an airplane.

"Lee Tires," painted on the sides of the machine in four-foot letters, is plainly visible at a distance of 2,500 feet. Circulars are dropped over the towns and landings are made at intervals, so that the publicity messages may be carried as far as possible.

The plan is working well so far and Fisher expects to keep the airship busy all summer, making the public acquainted with the tires, and in giving demonstrations in flights at a landing field near Cincinnati.

#### Extra Cars for Men Who Use Theirs All the Time

All those car owners who use cars regularly in their business-such as doctors, real estate men, etc.,-should be good prospects for additional cars for the use of their wives and the other members of their families. A doctor's car must always be at his beck and call so that it is difficult for the wife to secure the car for her own use. And as most doctors are pretty good moneymakers, it should be an easy task to sell them extra cars. Make a drive along this line and see the results it will get for you.

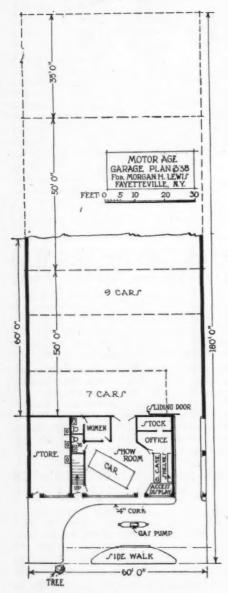
#### Let Your Advertisements Tell Real Price

Are you careful in your advertising to specify that the prices given for cars are the DELIVERED prices to the customer and include war tax? When the advertised price does not include freight and war tax there is always a lot of explaining to be done to the prospect as to the reason why he cannot secure the car at the price quoted and this invariably leads to a disappointed feeling on the part of the customer which may, in some instances, spoil sales.

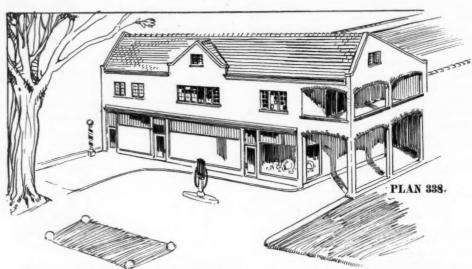


#### Making the Exterior Draw Trade

The Suggestion at the Right Has Some Attracting Qualities



Plan 338—This arrangement has provision for a filling pump in the front with a driveway at the right to reach the storage department in the rear of the salesroom



In the plan above the reader requests that an entrance be incorporated at the left for a barber shop; such an arrangement is, however, not to be recommended as the revenue rarely offsets the trouble caused by a tenant and handicaps the expansion of the business

Will you suggest a plan for a garage to be built in the residential section of a town of about three thousand inhabitants? I am most interested in securing an attractive front for both stories and a well arranged first floor.

Had thought of building 56 ft. wide with entrance through the front. Would it be practical to narrow down the building and have a drive along the west side

Had thought of building 56 ft. wide with entrance through the front. Would it be practical to narrow down the building and have a drive along the west side into the storage floor in the rear? This would narrow down the apartment on the second floor that much and might make it hard to secure a good arrangement of cars in the storage space.

into the storage floor in the rear? This would narrow down the apartment on the second floor that much and might make it hard to secure a good arrangement of cars in the storage space.

On the first floor in the front part would like to have space for car and small stock of accessories on sales floor; woman's rest room and toilet, and men's toilet; stairway leading to apartment on second floor (entrance on street); small space to rent for store or barber shop, etc., preferably on east side of building; driveway to storage floor.

etc., preferably on east side of building; driveway to storage floor.

This building is to be of stucco on hollow tile. The roof over the storage floor will be supported on steel trusses giving a clear floor space. I do not plan on doing any repair work at present but may later and I would sacrifice the space for store rental if necessary for good arrangement of other parts.

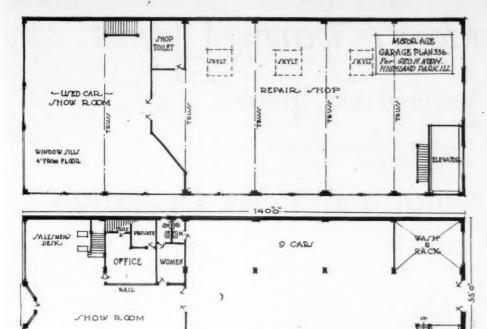
I had planned to have the gasoline in

I had planned to have the gasoline in the center front with a drive in on each side of the pump. This drive would be covered to protect the cars below in bad weather and serve as a porch for the apartment above.—Morgan H. Lewis, Fayetteville, N. Y.

We don't think much of your barber shop idea. If the third industry isn't strong enough to stand on its own legs in your town it might be better to start in another town. By eliminating the store you can push the stairway over to the south wall and have quite a respectable showroom and accessory store and we are certain that with reasonable success it will only be a question of time before you will have to do it anyway. After you have built with a store included it will cost more to change the store than it will net in rentals.

Instead of building the garage 60 ft. deep suppose you build only 50 ft. at present, adding another 50 ft. section when needed; that will still leave a 35 ft. strip for a shop when you get ready for it. Fifty feet will give you as much storage at present as 60 ft. and will save 10 ft. of structure. With the trusses spaced 17 ft. apart you will eventually come out even at the end of the lot and only have to buy two now.

A porch built out over the gas pump will make the showroom and accessory display very dark and uninviting. We believe it will be best to dispense with it for that reason; there are thousands of big filling stations without protection



A two story sales and service station with provision for quick service and adjustments on the first floor and the used car showroom and repairshop proper on the second floor

now and in fact those with protection seem to be the exception.

Since you are building in a residential section we suggest you discard the side windows and get your light from a few well placed skylights, which will be infinitely better. Then you can build right up to the lot line and there will be no chance for an argument with the adjoining property owners.

If you want a porch for the apartment build it over the driveway.

## A Second Floor Used Car Showroom

QUICK SERVICE GADUTMENT

PLAN 336

I want a plan for a Marmon sales and service building on a corner lpt 100 by 140 ft. The building will be either one or two stories and cover the full depth but only 55 ft. wide. It faces a street running parallel to the railroad in a north shore suburb of Chicago and should have a showroom and office 50 ft. deep.

We are of the opinion that if you do

not use the entire lot and have a business that supports a 50 by 55 ft. showroom you will need two stories. You, no doubt, will need a showroom for your used cars and it would be a good idea to use the front of the second floor for that purpose. We are acquainted with your location and as the suburban trains are all running very slowly past here either starting or stopping, it would be an ideal point for a big show window and would be novel enough to attract the attention of the thousands of well-to-do passengers who pass here every day.

The rear of the first floor would be devoted to quick service, adjustments, demonstrators and cars waiting to get into the repairshop, etc., while all of two-thirds of the top floor should be given over to repairshop activities.

### Reinforcing Old Wall

Would it be advisable to add another story to a building 100 by 40, the walls of which have a thickness of one brick and one tile, making them about 9 in. thick? Could it stand the added weight?

—W. Knight, Anselmo, Nebr.

This wall has plenty of strength to hold another story but should be reinforced or stiffened so that it will not buckle or collapse from the extra weight. Perhaps the easiest way to do this would be by means of concrete plaster at intervals of about 16 ft. so that they will come under the trusses. It would also be well to break away the face of the tile at two or three intervals in the height of the wall, then the concrete would flow into the openings and anchor the pilaster securely to the wall.

We might suggest that these pilasters be 6 or 8 in. thick and 24 in. wide and if you wish to do a specially good job, use two ½ in. round steel rods and run some heavy wire ties to anchors in the tile openings. If your tile is laid vertically, break away the face of one partition all the way from top to bottom. When you build the second story walls, the pilasters may be extended as part of the wall.

# Using Ramp with Safety

Often the garage contains a ramp as a means of reaching the second floor. This is always an incipient cause of accidents not alone to the car which gets out of control but to other cars, workmen, customers, and, in the case of the ramp that crosses the sidewalk at its bottom, to the general public as well. In the case of the last mentioned some sort of automatic warning signal is advisable to warn passers that a car is coming out. A good sized bell or an electric horn of the Klaxon type would do.

Another method that would protect cars both going up and coming down would be a device built like a railway block signal. A car approaching the ramp would run over a trap which would throw down a red flag at both ends. As the car passed out it would spring another trap which would raise both flags. Thus only one car could be on the ramp at one time whether going up or coming

# The Modern Garage in England



We are not in the habit of associating garages with England. The garage is such a modern institution and England so ancient and retrospective of knights and horses and armor, that we hardly ever think of the two at the same time. Neverthe-less, they have them, and they are apparently not unlike our American places except in the style of architecture used to ornament their fronts. This one in High street, Saxmundham, must be quite modern in style as it is very different from anything shown by our books on English arhitecture

# The Readers' Clearing House Questions and Answers.

CONDUCTED BY ROY E. BERG Technical Editor, Motor Age

# Principle of Motor and Meter Operation

"HDW the Electrical System Works," by A. H. Packer, are surely good articles and have done me more good than anything I have found on electricity as applied to automobiles.

In April 28 issue, Page 19, Fig. 4, I cannot figure by that illustration how the small coil is made and what the action of the electric current going through it does. Can you draw side view of same, tell all about flow of current and effect so I can understand same.—Ray Ide, Ide Shop, Outlook, Wash.

The principle of operation of both meters and motors is shown in the accompanying sketches, Fig. 1, gives somewhat more in detail, and in a clearer manner, the action that was explained in Fig. 4 on page 19 of the April 28 Motor Age. At "A" is shown a horseshoe magnet with its poles extending upward and with a coil pivoted and free to rotate in between the poles of the magnet.

A battery is also shown with wires leading current into and from the ends of the coil, the arrows along the external wires showing the direction of current flow. It will be recalled that in one of the electrical articles we were given a right hand rule that enabled us to tell the relation between the direction of current flow and the direction of magnetic action produced thereby. It was to grasp the wire with the thumb pointing in the direction of the current.

The fingers then point around the wire in the direction in which the magnetic force acts, which is the direction that a north pole would tend to move. Considering the RIGHT side of the coil we see current going in toward the paper so we grasp that side of the coil with the thumb pointing in and find that the fingers point as shown by the arrows. In a similar manner grasping the left side of the coil with the thumb pointing toward us, the arrows again show the direction of the magnetic field or lines of force. So much for the magnetic effect of the current in the coil.

Now we know that with a permanent magnet, there are lines of force traveling outside of the magnet from the north pole to the south pole so that between the poles of the permanent magnet, in the space where the coil is located there are lines of force going from left to right. We then have two sets of magnetic lines which affect each other more or less, and as lines of force cannot flow in opposite directions in the same space

Coil Protect and Free To
Robate & Book This Line

I times of Force
From N To S
Add With Lines
Produced by Coil
Adding On Top of
Right Side of Coil
and Under Left
Side. Thus Producing
Clockwase Rotation.

Showing Faild Distortion Around Sides of Coil.
Tendency of Lines To Strang them Out Relates Coil.

Fig. 1—Showing action which rotates a coil in either a meter or motor

at the same time we find that they cancel out or neutralize each other above the left side of the coil and below the right side.

In a similar manner they add up and strengthen the resultant field below the left side of the coil and above the right side. This compound effect is shown by the direction of the lines of force in the small sketch "B" and when we remember that the lines of force can be considered as elastic bands that are always trying to shorten, we see why the left side of the coil will be pushed upward and the right side will be pushed downward, which of course acts to produce rotation of the coil if it is pivoted and free to rotate.

In an electric meter the turning action is opposed by a spring, so that the coil

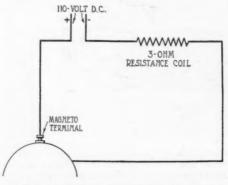


Fig. 2—Proper connections for recharging Ford magnets if 110 volt D. C. is used

only turns enough to balance the twist produced in the spring. The coil then comes to rest at some angular position, and a needle attached to the coil, will be made to read in Volts, Amperes or whatever readings the rest of the design re-

In a motor there are a large number of coils used, so that when one moves out of the field another or several more move into the magnetic field so that continuous rotation results. For further description of the action of motors reference should be made to the May 5 issue of MOTOR AGE in which Article 4 is given.

#### RECHARGING FORD MAGNETS

Q—Give instructions for recharging Ford magnetos in the car with alternating current. What apparatus will be required?—A. Sundstrom, Carroll, Iowa.

Alternating current cannot be used unless a rectifier is used to convert to direct current. If storage batteries are available very satisfactory results can be obtained by using them as the source of magnetizing current. The problem of remagnetizing the Ford magnets without removing them from the car is simply a case of getting these magnets properly placed and sending sufficient current through the coil to produce saturation of the magnets.

The success of the operation depends upon the correct setting of the flywheel. Remove the spark plug or open the priming cups and have someone turn the engine over slowly. Disconnect the ignition cable from the magneto terminal and hold a compass 6 in. to the rear and 1 in. to the left of this terminal. When the compass is in this position and the north seeking end of the needle points straight toward the front of the car, the flywheel is in the correct position.

The other way to make the setting, if no compass is available, is to take the cover of the transmission off by removing the six screws and after locating the brass studs in the rim of the flywheel turning the engine over slowly until one of them is about in line with a point 1 in. to the left of the binding post. It is then ready to apply current.

Fig. 2 shows the proper connections if 110 volts D. C. is used.

If batteries are used, connect about four or five in series and make the connections as shown using the batteries in place of the 110 volts. When batteries are used the resistance in the circuit should not be used.

The recharging operation is to simply make and break the contact at the magneto terminal. The only precaution necessary is not to hold the connection long enough to heat up the windings. It will be necessary to make and break the contact several times before a good charge will be obtained.

#### INSTALLING FORD CUTOUT

Q—We have a 1917 A. B. C. starting and lighting system on a Ford car. The controller on the generator does not operate. Can we put a Ford cutout on this generator? If so, publish diagram showing connections.—Ernest J. Hill, London, Ohio.

The current output of this generator is externally regulated by means of a Ward-Leonard controller and cutout mounted on the top. The standard Ford cutout unit cannot be substituted for the reason that it is in no sense a current regulator but simply a cutout and serves no other purpose than that of connecting the battery to and disconnecting it from the generator at the proper voltage values. It is recommended that the present faulty controller be either repaired or turned in on the standard exchange proposition offered by the manufacturers.

#### RECHARGING WITH FORD MAGNETO

Q-We have a Western Electric light plant with a 180 amp. hour battery. How do you connect a Ford magneto to this outfit to recharge it?—Ernest J. Hill, London. Ohio.

Owing to the low voltage and current capacity of the Ford magneto, about 16 to 24 volts for the former and about 5 to 7 amps. for the latter, it would be most impracticable to attempt to charge such a large battery with it. This for the reason that the current source must be of a higher voltage than that of the battery, in this case 32 volts, and if an amperage capacity of 10 amp. or more. A secondary objection is that the current from the Ford magneto is of a very high frequency, alternating nature which necessitates its rectification when used for charging batteries.

#### TIMING HUP 32

Q—Advise valve and ignition timing of Hupmobile, Model 32, equipped with Bosch magneto model DU 4.—W. A. Byrd, Charlotte, N. C.

The valve timing of a Hupmobile, Model 32, is as follows: Turn the engine over until the marks C1—1 and 4—UP on the flywheel are near the top. Stand squarely in front of the engine and shift this mark % in. to the right of the punch marks on the face of the front cylinder. See that this position of the flywheel is not altered while the work is going on.

Note how the large time gear shows through the opening at A in Fig. 5, also note the punch marks at the center, on the face of and at either side of the opening of the side plate through which this gear protrudes. Now turn the gear until the punch marks across the face of one of the teeth are in line with the marks either side of the opening, as at A. Keep the gear in this position. Get two 5/16 by 2½ in. U. S. S. standard thread bolts and cut the heads off form-

The Readers' Clearing House
THIS department is conducted to
assist Dealers, Service Stations,
Garagemen and their Mechanics in
the solution of their repair and serv-

ice problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

ing studs. Then screw these into the crankcase as at D.

Now slip the crankcase side cover F onto these studs and let it hang there. Secure a sheet iron plate E that will run the entire length of the engine and slide it under the valve stems C and rest the plate on the valve tappets. Have a second person handle the plate. As the crankcase side plate is tapped in place with a hammer have the valves raised so

that the tappets will slide in underneath the stem ends. The valves can be raised by pressing down on the plate as at E. See that the large time gear does not shift out of position.

Do not replace the crankcase side plate with any less number of paper gaskets than were used originally, otherwise the gears will not mesh properly. When you are sure that the large gear is meshing properly, bolt the side plate up snugly using the regular bolts. Now remove carefully the plate holding up the valves. Before putting back the magneto, remove the distributer disk D, Fig. 6, which will reveal the distributer brush F. Turn the gear until the brush is in the position shown.

Remove the conducting bar G and also the inside aluminum plate K. This will expose the armature. Insert a rule as shown and see that the edge of the armature is % in. from the side, while the distributer brush is still in its proper position. Hold the armature in position and place the magneto on its bracket on the side plate, meshing the large gear with the magneto gear. Do not mesh the gears too tightly. When the magneto has been properly set, draw up the bottom bolts tightly and also screw up the

# Adjustable Lights for the Washrack

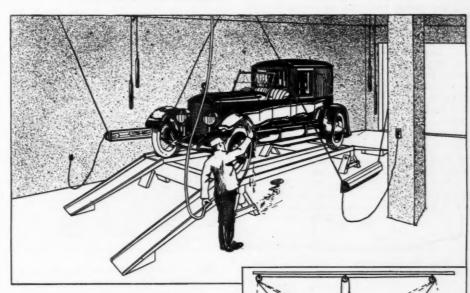


Fig. 3—Lights installed following the above suggestion are adjustable to throw the light on any part of the car while washing it

#### LIGHTS FOR WASHRACK

We are about to start a washrack and would be pleased to have some suggestions from you. We have already installed the drain and would like some information concerning electric lights as we cannot depend upon daylight to give sufficient lighting.—Simonds Motor Supply Co., Zanesville, Ohio.

The illustration, Fig. 3, will give you an idea for adjustable lights that we have seen used to good advantage. They may be raised or lowered and stay substantially where put. Lamps are sometimes placed permanently around the

base of the washrack wall where they are protected by heavy wire screen, but however installed, lamps must be partially shaded by reflectors which will throw the light on the work without shining in the washer's eyes any more than necessary. Most any kind of a runway to get the car to an elevated position will answer the purpose. Steel channels are especially good for the purpose because they are strong without being bulky enough to interfere with the washing operations.

bolts B. Replace the conducting bar and plate K and the job is done.

The ignition timing is as follows: Move the spark advance lever D, Fig. 4, to full retard, that is, all the way down. Take off the brass cap held on the lower part of the rear end of the magneto by a fit spring, thus exposing the circuit breaker. Turn the armature over two or three times and note how the two platinum breaker points separate as the breaker arm C makes contact with the flat cam. The spark occurs in the cylinder at the instant the breaker points separate.

Remove the rubber distributer plate F by squeezing the springs G against the magneto and at the same time pulling off the plate. Turn the armature shaft until the distributer brush E is in position shown in Fig. 4, at which time the breaker points will be just about to separate. Now, being careful not to remove the camshaft or flywheel, put on the timing chain. If it is necessary, move the timing sprocket slightly in order to get the chain on. It is preferable to move the armature in a left-hand direction, since for perfect timing the spark should occur when the firing line B coincides exactly with line A.

Now test the accuracy of the timing by turning the flywheel over two revolutions. If the breaker points separate when the firing line is within ½ in. of either side of the center line, the timing is correct, but if the timing is more than ½ in. off,

it will be necessary to remove the chain and turn the magneto drive sprocket one tooth in the proper direction. A movement of one tooth will make a difference of  $2\frac{1}{2}$  in. on the flywheel. If the breaker points separate before the line B is on center, the spark is too early and the armature should be moved in a clockwise direction and if the spark is too late the armature should be moved in an anticlockwise direction.

If moving the sprocket one tooth causes the spark to occur too far in the opposite direction, one-half a tooth difference can be obtained by unscrewing the magneto driving sleeve nut A, Fig. 4, and pulling the driving sleeve B out of the slots in the magneto sprocket C. Then without removing the armature give the gear one-half a turn and recouple. When coupling see that the cork oil retaining washer D and E are in their proper places and in good condition.

The camshaft and generator silent drive chains will stretch slightly after considerable service and they should be inspected and tightened if found to be loose after the first 2,000 miles and once a year afterward. A chain is at proper tension when it does not sag between the sprockets, but can be pushed in about 1/8 in. at the middle of the longest span. To adjust, remove cover over the magneto sprocket and take off the four nuts that hold the magneto support, remove the shims, Fig. 5, from on top of the magneto support, pull the magneto

straight up as it can be raised by hand and insert as many shims as required to maintain this height under the magneto plate.

If the generator chain is so tight that it is impossible to take the necessary slack out of the camshaft chain, it will be necessary to loosen the two nuts that fasten the generator base to the crankcase, also the two nuts on the generator sprocket bracket and slide the generator in a little closer to the cylinders. Push the magneto forward as far as possible when tightening up the nuts, to prevent oil from leaking around magneto shaft. In case you have found it necessary to loosen the generator, do not forget to tighten generator chain by moving the generator away from cylinders and be sure to put in and spread all cotter pins.

#### POWER RATIO DIMENSIONS

Q—What bore and stroke will a sixcylinder engine have to have in order to develop 25 hp. at 1,700 r.p.m.?—C. H. Runyon, Sigourney, Iowa.

A very good ratio dimension which will develop the desired power is bore, 3 in.; stroke, 4 in.

#### BURNING OUT OF RELAY

What caused the cutout and limiting relay in a Northeast generator on a 1916 Dodge car to burn out? Could an ammeter, showing charge and discharge, be installed in place of the present C. O. D. indicator?

The burning out of this unit is usually caused by one of four things, badly sulphated battery, short or open circuit between generator and battery, or reversed connections. The effect is the same in the first and third cases as a very high external resistance is introduced which causes a building up of an excessive current in the limiting relay windings. Rarely does the master relay suffer.

Although there is apparently no excuse for getting the connections reversed, the generator being plainly marked, this is a common occurrence and invariably results in the complete destruction of the relay. It would be possible to install an ammeter in place of the indicator by arranging a fairly heavy switch in parallel with it and using it to cut the meter out while using the starter. The weakness of this is that, sooner or later, closing the protecting switch would be forgotten and the full starting current, passing through the meter, would entirely destroy it.

#### BURNT VALVES

In the April 21 issue of Motor Age we answered a question concerning burnt valves in a Dodge car which referred to rapid wear in production jobs. In most cases the chief cause of burnt valves is overheating of the engine and the overzealous desire of the car owners for an absolutely noiseless valve, thereby adjusting the valve tappets so close that the valves remain open and allow the hot gases to blow out and burn the The correct valve clearance is valves. from .003 to .004 and should never be determined in any other way than by the use of feelers. The correct valve stem clearance is from .002 to .004.

## Timing the 1912 Hupmobile Engine

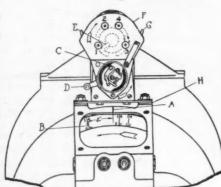


Fig. 4—Reference is made on this page to the above cut for timing a 1912 Hupmobile

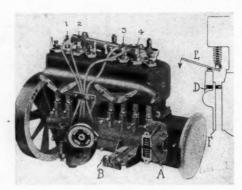
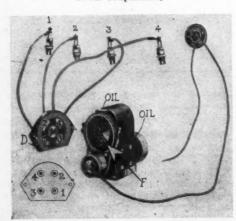


Fig. 5—Hupmobile engine showing large timing gear at A



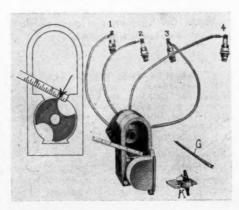
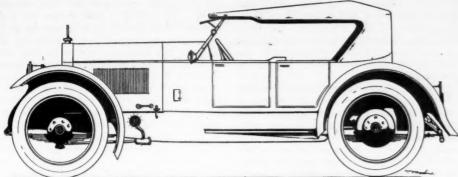


Fig. 6—Points to be observed in timing a 1912 Hupmobile. A ruler is used for setting the armature correctly



-Motor Age design for remodeling a seven passenger Studebaker into a four passenger sport model

#### PLAY IN STEERING GEAR

Q-How is the backlash taken up in wormgear of a Studebaker For el 19. The gear teeth are not worn Four,

2—Explain method of removing clutch of Studebaker Light Four, model 19.
3—Could the Universal joints on this car be replaced by Thermoid flexible joints?—V. F. Neiderhiser, Salem, Oregon.

1-To correct the play in the steering gear, block the front wheels of the car clear of the floor so the weight is removed from the wheels and they can be readily moved with the steering wheel. With the steering wheel turn the wheel to the extreme right hand position. There is always less wear at the angle positions than at the straight ahead position, and a tight adjustment straight ahead would probably cause binding at the angular positions.

In the extreme position work the steering wheel slightly to determine the amount of backlash. If the steering column moves up and down loosen the clamping bolt and slowly turn down the nut until all of the end play is eliminated. Then tighten the clamping bolt. If this adjustment fails to remove the backlash turn the worm wheel one-quarter the way around.

This can be accomplished as follows: Loosen the clamping bolt. Remove the steering arm. Turn the steering wheel one-quarter around and replace the steering arm and clamping bolt. This will present the engaging of entirely new thread surfaces on both worm wheel and worm gear.

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2-The service operation necessary in replacing the new leather cone is as fol-Take out the rear plug in the clutch hub, depress the clutch pedal, insert a small punch in this plug hole so that the clutch engaging spring will be held in the depressed position when the retainer nut on the end of the crankshaft is removed. Next remove clutch throwout shaft by removing the two bolts at each end holding the shaft throwout bracket to the sub frame, and the nut in center to which clutch throwout yoke is attached.

Take out the four bolts which hold the flexible disk to the transmission pinion flange ,and the six machine screws which connect the flange to the clutch This will permit the removal of cone. the entire joint assembly. Take off retainer nut on the end of the crankshaft and remove the clutch cone. New clutch leather can be purchased from the manufacturers with the ends cemented together and it is only necessary to slip it over the cone and drive it into the proper position with a mallet or piece of

3-The construction of the driving mechanism of this car will not permit the use of a flexible joint.

#### REMODELING STUDEBAKER

I have a Studebaker, seven passenger car which I would like to remodel into a four or five passenger car with gas tank in the rear, a neat, low top and windshield. I want a low body with two doors. Please show a suggestion for such a body.—T. R. Collins, Farmville, Va.

Fig. 7 shows the general outline of a design which, we believe, will meet with your approval.

#### H. C. S. WIRING

-Publish wiring diagram of the Delco ignition system on the new H. C. S. Special showing all internal and external connections.

2-On the distributer there is a short. spring-like coil of what I take to be a high resistance wire. It looks to be in the line that runs from the coil to the break-er points. Explain the purpose of this and how it works.—John Wm. Campbell, Syracuse, N. Y.

1-A complete wiring diagram of the Delco system used on this car is shown in Fig. 8.

2-The resistance unit to which you refer is connected in series with the primary winding and prevents excessive discharge from the storage battery when the engine is not operating and the ignition switch is turned on. It also causes the spark to be more uniform. The resistance wire used in the construction of this unit has the property of increasing in resistance as the metal heats up.

#### COUNTERWEIGHTING DODGE CRANKSHAFT

Q-What is the gear ratio of a 1917 Dodge Brothers Car? Is it the same or higher than the later models?

2—Would installing counter balances on the crankshaft be of any benefit; that is, would it reduce vibration and make a Dodge Brothers engine run smoother or would it be hard on the crankshaft? Would it be any improvement at all? Would there be danger of counterweights working loose?—Geo. H. Ribbing, Hite-

1-The gear ratio of the present Dodge is the same as the 1917 model being about 4.17 to 1.

2-Counterweights have been installed on the Dodge crankshaft in a few cases where the cars were being rebuilt for racing purposes, but reports from the men building the jobs show that no particular advantage is gained. The installation is not simple and unless carefully made will cause a lot of trouble.

#### HEAVY OIL CONSUMPTION

Q—New Gill one piece rings have been installed in an Auburn 639 having a 7 W Continental engine which has been driven about 5,000 miles. A blueish gray smoke still emerges and a quart of cylinder oil only suffices for about 50 miles. Could it be the valves, or leaking pistons?

2—Publish diagram showing how to remove and grind valves on a 7 W Continental engine.—Claude De Jean, Duson,

1-With all respect for the one who installed the rings we feel that if a bit more care had been exercised in installing the rings the heavy oil consumption of the engine would not be so troublesome. Now, of course, if there is any oil leaking out of the bearings or through the oil pump or some place where it should not, then this criticism is not just or valid. There is no place that the oil

can leak out of an engine.

# Wiring of H. C. S. Special—Delco System

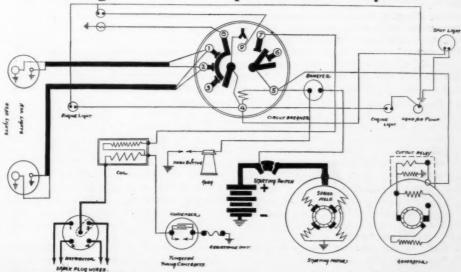


Fig. 8

# HOW THE ELECTRIC SYSTEM WORKS ARTICLE VII

(Concluded from page 32.)

machine and the battery, the average temperature and conditions of driving.

The usual settings recommended by the various generator makers are outputs that will not injure the machine, but necessarily these do not take into account the other conditions above mentioned.

These conditions are, however, taken into consideration by the Auto Electric Engineering Co. of Chicago who get out a chart that is said to indicate the correct charge for any condition of driving, temperature, battery size, etc. The usual setting of a Ford generator is 10 to 12 amp. which satisfies the average requirements.

Another means of regulation is shown in Fig. 3, this being known as a bucking series machine, as two field windings are used, one a fine winding which originally magnetizes the fields and the other a heavy winding of fewer turns which carries the battery charging current and acts to oppose the effect of the fine or shunt winding. Another name for the heavy winding is "Differential Field" which is really the proper term to use although it is better known by the other name.

In this machine the heavy winding has no effect until the cutout closes and the charging current begins to flow to the battery. As the speed increases and the current tends to become excessive the demagnetizing action weakens the generator and holds the output to a permissible amount.

In Fig. 4 is a machine of similar type but a variation will be observed in that two terminals are brought out, one directly from the plus brush to supply current to the lights and the other getting its current through the series field and supplying current to the battery. It will be apparent that all current to the battery goes through the bucking series winding and, therefore, operates to hold down the output, also that current to lights does not go through the bucking coil and, therefore, has no regulating effect.

The charging rate of the bucking series generator can not be varied at will as can the third brush machine, but gives the output for which it is designed unless some defect is present. Excessive output may be due to the series field being either shorted out or reversed. This can be determined by shorting the "L" and "B" terminals together while running, which in a normal machine should increase the output. Failure to see a rise in the charging current indicates the troubles above mentioned. To check for reversed series, turn on the lights while the engine is standing.

This will reverse the magnetism and cause the generator to make the ammeter kick suddenly to the discharge side when the engine starts. A novel feature of the machine shown in Fig. 4 is the connection of the shunt field and the shunt coil of the cutout in the same circuit. This does not affect the essential

action of either but has some structural advantages when the cutout is to be incorporated in the generator, this general type of machine being one designed by the Westinghouse company and put out in considerable quantity several years ago.

Another characteristic of the machine shown in Fig. 4 is that its output is greater at night than in the day time, that is the machine delivers more amperage when the lights are on than when only charging the battery. Thus if the lights need 6 amp. and are turned on at a time when the battery is receiving 10 amp. charge, it would look as if the charging current would drop to 4 amp., but this is not the case, as the diversion of 6 amp. to the lights reduces the bucking field action and the charge to battery will now be about 6

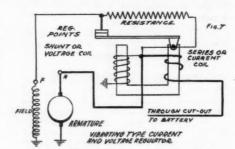


Fig. 7—The windings of a combination type current and voltage regulator are shown above. With this type of regulator charging current is proportioned to the condition of the battery

amp. also indicating that the machine is now generating 12 amp. instead of 10.

Another type of regulation is shown in the diagram in Fig. 5 which outlines the general arrangement of a vibrating type voltage regulator. As in the other type of regulation, it depends on weakening the magnetic field at high speeds, but accomplishes this result in a different manner. The regulator itself consists of an iron framework similar to that used in a cutout switch, but in this case the action of the magnetic pull operates to open instead of close a pair of points, while a spring is used to oppose the magnetism and close the points.

The generator field winding is so connected that it receives its current from the armature through these regulator points, which have a resistance connected across them which serves to reduce the field current when the points To operate the contacts a fine winding is used on the regulator frame, this winding receiving current directly from the armature so that its magnetic effect is proportional to the armature voltage. As the generator starts, the action is as follows: Current from the "A" or armature post of the generator flows to the regulator and divides, part flowing across the points, which are closed, and back through the shunt field, and part flowing through the fine winding on the regulator.

The current in the field coils makes the generator produce more voltage and the current in the regulator coil begins to exert a pull on the lower contact arm. As the speed increases and the voltage rises, the cutout (not shown in this sketch) will operate to connect the generator to the battery, which will act to prevent any appreciable voltage rise, additional output from the generator being in the form of current instead of voltage.

As the battery becomes charged, however, or should a wire or cable to battery become disconnected so as to limit or stop the flow of charging current, the voltage of generator will immediately rise and send more current through the regulator coil.

This will increase the magnetic pull of the regulator and open the points causing the field current to flow through the resistance, thus reducing its value and lowering the generated voltage. The lower voltage will in turn weaken the regulator and allow the spring action to close the points again strengthening the field and raising the voltage.

The continuation of this action will produce a vibrating action of the points and by regulating the air gap and spring tension the regulator can be made to hold the voltage to any desired value. The setting usually desired is one that holds the open circuit voltage (battery disconnected) to about eight, which will be sufficient to bring the battery up to full charge, when the cutout operates to connect the generator to the battery.

Voltage regulation has the disadvantage that a setting that will bring a battery up to full charge, may allow an enormous current to flow when charging a battery which is very low, so that the vibrating type of regulator is sometimes used to control current instead of voltage, as a heavy current for some time will burn up both the generator and battery.

In Fig. 6 is shown a current regulator in which the field current still flows through the points but the magnetic action is now obtained from a few heavy windings or series coils as they are called, through which the current to battery is allowed to flow. As the current to battery increases the magnetic pull increases and the points begin to vibrate as in the other type and weaken the field to hold the current to a value determined by the air gap in the regulator and the tension of the spring.

Current regulation also has a disadvantage, in that should the battery become disconnected by accident, no current will flow through the series coils of the regulator and there will then be nothing to limit the voltage of the generator which will rise to an enormous value as in the case of the third brush machine, and burn out its own windings and any lamps or other equipment that might be connected. For this reason the regulator of this type that is most commonly used is a combination of the voltage and current regulators as it has both a shunt coil affected by the voltage and a series coil affected by the current.

This combination regulator is shown in Fig. 7, and its action is such that the battery is taken care of in an ideal manner.

ARITCLE VIII NEXT WEEK

## IN THE PAINT SHOP

## Painting by Dipping

Articles can be painted by dipping whenever they can be immersed in a tank containing the specially prepared paint suited for the work. It is the quickest way that such parts can be coated, and any number of coats can be so applied.

Combinations of coats are sometimes employed where the first coats are put on by dipping and the finish by spraying or brushing. Any of the stripped parts on an automobile can be dipped providing they are not damaged by the process. Some lamps have their reflectors soldered in, or are otherwise built so that they could not be satisfactorily dipped, and windshields could not be dipped without stripping them of their glass. But the fenders, hood, splashers, radiator shell (if stripped), bumper, lamp and tire carrier irons, wire wheels, rims and lugs, hood ledge strips (rave strips), curtain rods, top support irons, etc., can all be satisfactorily dipped.

The dipping tank should contain enough of the dipping paint so that the article can be completely submerged in one operation, and this means that a tank large enough to accommodate all sizes of these stripped parts would have to contain at least 150 gal. of material. This makes the work expensive from the standpoint of first cost if a quantity production is not contemplated. For this reason no other color than black should be stocked unless you have a large amount of color work at hand that will warrant such an investment.

Most all stripped parts are finished in black, or can be so finished, and hence black becomes a standard color. There are two different kinds of coats applied in bringing up these parts in the black

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baked-on enamel (high heat), so you will see that two tanks would be required, each one holding around 150 gal. of material.

No attempt should be made in the job shop to dip the stripped parts unless their baking is intended, as the baking materials have the necessary flowing qualities of a dipping paint. Materials that are applied with a brush are also laid off with it, but when an article is dipped it is hung up to drain, and the paint must flow over it and form a uniform coating by itself. That is why special bodied materials are required for the work.

We do not mean to say in the above that dipping cannot be done when parts are to be air dryed, but rather that dipping should not be done in the job shop doing automobile painting unless their baking is intended, and then the work can be done with the baking materials that are suited for dipping. Dipping is a method of painting practiced by hundreds of different manufacturers, but the problems of the job shop are the ones before us. The advantage of such a system are obvious where there is enough work at hand to warrant the investment-the saving of time being the big advantage. Dipping paints run from \$1.25 to \$1.75 per gallon (black).

## Painting by Flowing-On

Painting by flowing or pouring the paint material onto the article is only a modification of the method of dipping. In factory work it is not practical to dip an entire automobile body into a tank of paint as only the outside of it requires painting—so here the paint is flowed over the surface and the surplus allowed to drain off. All coats can be so applied and

a very smooth surface obtained that requires very little rubbing.

The apparatus as used in factories consists of an elevated or floor tank containing 25 gal. or more of the paint, and from this a flexible metal hose extends with a special slotted nozzle at its delivery end. This nozzle has a valve control operated by the workman and the body is coated by starting the flow of material from the nozzle and passing the jet around the top edge of the body and allowing enough of the material to flow onto the surface so that it will run down and cover the panel beneath.

The body is supported on a platform which has a trough running around its edges, and the paint that drips off runs into this and is collected at one corner, strained and used again.

#### Not Practical for Job Shops

Where the tank is overhead the paint runs down through the hose by gravity, and where located on the floor it is pumped up by means of an electric motor, and here the drippings are automatically strained and collected and pumped over again.

We describe the foregoing to show you just how this process is used in automobile factories. For the job shop the flowing-on of bodies is not practical as it necessitates the body being stripped from the car. Such methods can however be used for coating the stripped parts, whenever they are to be baked, as the baking materials have the flowing properties necessary for this sort of work. Expensive apparatus of this kind is not essential for ordinary job shop requirements, although it is practical to arrange an overhead tank as just described.

Dipping and flowing of the stripped parts can be combined in the job shop, and such a combination will result in an economical installation of tanks and a saving in the first cost of material. Thus tanks holding 25 gal. of material can be used for dipping such parts as will fit and the same material can be used for flowing the fenders and splashers which are too large.

The flowing of the fender or splasher would be accomplished here with a 2-quart dipper which would be used for pouring the material over the part. This will be described more fully in a later lesson. No other color than black should be stocked unless you have a quantity demand for some particular color.

#### CONTRASTING DIPPING AND FLOW-ING

You can now see that less material would have to be kept on hand when flowing, but that dipping is the quicker. The finishes obtained are the same. It would take about 2½ hours to dip all of the stripped parts including five wire wheels, and about twice that long to flow them. Thus you can see that by combining the two methods a very satisfactory arrangement can be worked out where a low first cost is desired. This would do for a small shop but where a large quantity of work is handled it would be quicker to rig up for dipping alone—black materials only to be stocked.

# Painting Bodies by Flowing-on Process



For flowing-on of bodies the body must be removed from the chassis, and is therefore not practical for job shops. The operator starts the flow of paint and draws nozzle around the top edge of the body allowing enough material to flow onto the surface to run down and cover the panel The outfit below. shown here is the DeVilbiss Floco system

# The Accessory Show Case New Fitments for the Car

Hayes Shock Absorber embodies a leverage principle whereby in using a coil spring as a fulcrum double the movement is obtained at the end of the car spring compared with the coil spring. If the end of the car spring moves 1 in. the coil spring moves 1/2 in., thus all the small shocks are absorbed as well as the big jolts reduced to a minimum before reaching the body of the car. This mechanical design has the effect of lengthening the car springs to more than double their present length.

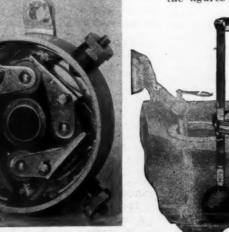
This shock absorber works with the car spring but a coiled spring will vibrate much faster than a leaf spring and is also in position to take the shocks which come very fast when a car is traveling at a fair rate of speed. The coil spring is mounted between the jaws of the shock absorber with a simple clip gripping the last coil and fastened with a cap screw.

#### Rearvu Mirror

The purpose of this mirror is to reflect clearly road conditions in the rear. It can be instantly adjusted to the most convenient position with the windshield either open or closed. It is made of beveled plate glass, 10 by 2 in., with brackets of heavy nickel plated brass. Its construction is such that vibration is claimed to be positively eliminated. It can be mounted above any windshield on open or closed cars. All metal parts are claimed to be rust proof and to retain their original lustre. The Fulton Co., Milwaukee, Wis.

## Apex Gasoline Gage

The Apex gasoline gage for Ford and Chevrolet cars is so designed that the contents of the gasoline tank can



Apex gasoline gage

March distributer



Rearvu mirror

be ascertained in the dark as well as in daylight. Another feature of this gage is that it is not necessary to remove it while filling. The indicator is made of clock tempered spring steel and the figures are etched, thereby insuring

a permanent graduation. No tools are neces-sary for installing, as this gage simply replaces the filler cap. Price \$1. Apex Electric Mfg. Co., 1410 West 59th street, Chicago.

#### Reserve Valve and Filler Neck

Assembled in one piece, this reserve valve filler neck is for use in connection with the vacuum system. The reserve valve, when feeding from a full tank of fuel, feeds through the short tube as shown in the illustration, until the supply has been consumed on this tube which will then refuse to feed the engine. It will, however, leave a supply of gasoline in the tank sufficient to last until a gasoline supply station is reached, by operating the reserve valve from supply to reserve, permitting the reserve fuel to be consumed. The reserve valve now being in operation, the filler cap cannot be removed from the filler neck until the valve has been reversed to the regular supply.

Only one opening in the gasoline tank is necessary for installing this device, it being made in one complete assembly in place of three. Price, complete, \$5.50. Ideal Brass Works, 560-570 N. Elder avenue, Indianapolis, Ind.

### March Distributer for Fords

The March distributer is installed in place of the ordinary Ford timer and in the same manner, but its electrical and mechanical construction is such that it differs from other timers. There are no current-carrying rollers, no wipe contact, no race and very slight motion in the moving parts, according to the manufacturers. Electric contact is made by the direct make and break system. It carries a very strong guarantee and retails at \$5. American Metal Products Co., 72 West Adams street, Chicago.



Hayes shock absorber

# Service Equipment Time Savers for the Shop

#### J. & B. Ignition Test Stand

This device is for testing ignition coils, spark plugs, magneto armatures and lamps. It consists of an iron base with breaker, fixed and adjustable spark gaps, button switch and lever switch. A hand wheel actuates the breaker, and cables with snap connectors are provided for testing. A condenser is mounted in the base for testing condensers of coils and when testing coils not equipped with condensers. A supporting stand and high tension terminal are provided for testing magneto armatures. A chart of wiring diagrams is furnished with each instrument. Price, \$100. J. & B. Mfg. Co., Pittsfield, Mass.

#### Caldwell Tire Remover

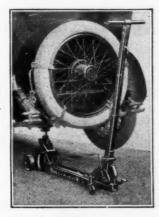
Any size tire from any make wheel or rim, straight sides, can be quickly removed by means of the Caldwell tire remover. It is a solid casting weighing 300 lb. and has a machined channel 37 by 5 in. in which a heavy air tube works, pushing a wooden core with equal pressure against the inner circle of tire at the head, forcing the tire from the rim seat. During the process, the rim is held in place by a 30 lb. spider. Manufactured and distributed by the Caldwell Motor Accessories Co., 408-410 N. Central avenue, Knoxville, Tenn.

#### Roll-A-Car

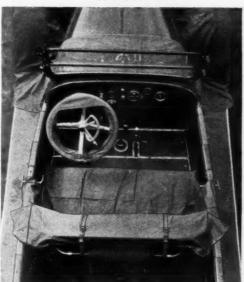
A very efficient garage jack has recently been perfected by the Walker Mfg. Co., Racine, Wis. A finger lever on the handle controls the entire functioning of the jack and the leverages have been worked out to give a quick lift with short strokes. Six strokes of the handle raise the load 6 in. Only by revolving the lever and by pumping down can the load be lowered, eliminating the danger of accidents from pumping against the lever on the jack handle.



Caldwell lightning tire remover



Roll-a-car



Car overalls



Automatic vending machine

When a job is left jacked up the Roll-A-Car can be set and left in any desired position so it is always out of the way. The weight is only 120 lbs. and the capacity 5,000 lbs.

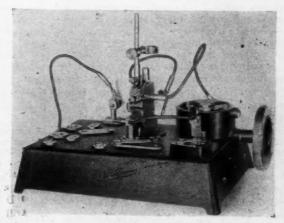
#### Automatic Vending Machine

This machine is controlled and regulated by air pressure and being of the automatic type does not require an attendant. The customer merely places the hose in his tank, inserts a coin into the slot, pushes a button and receives his gas. The measurements are guaranteed to be absolutely accurate even when handling blended gases.

The amount of gasoline for the given amount is measured, either a quarter, half dollar, or dollar. The machine can easily be set according to the market price of gasoline. By unlocking the service end, personal service can be given if the customer so desires or if the gas is sold on credit. But 15 lbs. of air pressure is required to operate this machine. The Anthony Liquid Vending Machine Co., St. Paul, Minn.

#### Car Overalls

These overalls are quick-attachable covers to individually protect the front fenders, front seat, cowl and steering wheel from grease and dirt in the shop. The fender overalls use spring clamps and the other units use cords or straps. a rod being inserted in the seat cover to automatically force the seat cover to its proper position. The entire set can be attached in less than 1 minute and removed in about the same time. They are sold individually at the following prices: Fender covers (two), \$7.50; seat cover, \$4; steering wheel cover, 75 cents. The overalls are made of a durable material with a soft fuzz underneath to protect the finish. They are washable. Keep-Klean Auto Products Co., 1819 Broadway, New York.



I & B ignition test stand

# The Automotive Repair Shop Practical Maintenance Hints

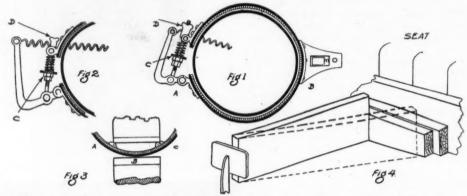
# Equalizing and Adjusting Brakes

GOOD many important details concerning the brakes of a car are often neglected. The result is that the brakes may drag and increase the gas consumption and decrease the ability to climb hills; or the brakes may apply unequally and cause most of the work to come on one tire. If one side is doing all the braking, there is greater liability of locking of the wheel, in applying the brake hard, and a tendency to skid in wet weather.

Before doing any work on the brakes it is well to go over all the pins, movable parts, turnbuckles and adjustments with a brush and kerosene. This will loosen dirt and caked grease so when going over them again with a brush and oil (oil drained from the crankshaft will do) it will find its way easily to all working surfaces. All grease cups should be filled and where broken off the holes should be cleaned out with a wire and kerosene applied with a brush, followed by oil and then sealed over with grease.

A block must be placed each side of a front wheel to keep the car from moving before jacking up both rear wheels. If only one jack is available, use blocks on one side. It is very necessary to have the brake band clear the drum, when the brake is released. The wheel should turn freely when you are testing a brake for dragging. Be sure that the other is clear and not interfering with your test. Considering the external contracting type, the band support at B should be adjusted so that there is a clearance between the drum and the brake lining of 1/16 in. to 1/8 in. If the band is sprung so that it tends to clasp the drum, no amount of adjusting will be of any use.

The band should be removed and bent into a large circle. Care must be used not to kink it. A good way to bend is shown in Fig. 3. A gentle pressure is applied at frequent intervals as a, b, c, by the vise. A ball of waste should be placed at each jaw corner to prevent the vise digging into the lining. The internal expanding type bands are not subject to spring on account of rigidity of construction so if the brake drags when fully released, it will be necessary in most cases to remove the wheel and examine the release springs and see that they function properly. Go over all moving parts with kerosene and oil. To return to the contracting type with the brake released, the top of the lever at A should be well back toward the drum. If necessary lengthen the brake rod under the car. The place C is fixed to the axle housing and the unit just below it should



Figs. 1 and 2 show the nuts for adjustment of braking pressure. Fig. 3 illustrates method of obtaining a better fitting brake band support. Fig. 4 shows how pressure may be applied to the foot pedal while turning rear wheels

be set so that the lower part of the brake band just clears the drum. Do not tighten up lock nuts until you are all through with both sides. This will facilitate any little readjustments that may be required. The wing nut D should be set so that the upper band just rides clear.

#### EQUALIZING THE FOOT BRAKE

The foot brake rigging includes as a rule an equalizer but nevertheless inequalities of braking may occur through varied adjustments on the band on certain types. This is shown in Figs. 1 and In Fig. 2 the nuts at C and D have been screwed upward so that the lever stands well out. The result is that the release spring is in greater tension than in Fig. 1 and offers a greater resistance to the brake when applied. Hence through the agency of the equalizing lever, the brake offering the least resistence (Fig. 1) is applied harder than the other. It is, therefore, important to have the adjustments at A approximately the same on either side.

Before equalizing the brakes be sure you have taken them up, if that is necessary, preferably on the rod to the pedal or hand lever. To equalize the foot brake, get a board and some blocks. Get in the front seat and push down foot brake so it will be applied gently. Block in this position with board as in Fig. 4. Then try to turn rear wheels. If neither will move, ease off the brake by moving board to one side, as indicated by dotted lines. When one or both wheels can be moved, ease the brake which holds the hardest by tightening the nut at C. Fig. 1 and loosening the nut at D (i.e. screwing both upward). This will move the lever out toward position in Fig. 2, when the brake is ap-

plied, and the release spring will offer greater resistance and hence the brake will hold less.

The hand brake rigging does not usually include an equalizer. It should be taken up so that brake begins to apply at second or third notch. The equalization is done as with the foot brake, the lever being put in a notch which will hold slightly and then the brake rod on one or the other side is adjusted until each wheel offers the same resistance.

When new lining has been applied it is well to run the car for a week with the brakes rather slack to prevent dragging. The rough places and projections of the lining will then have worked off and the car may be jacked up, brakes taken up and equalized.

An eccentric brake drum, i.e. one which is not set truly on the wheel, will cause the band to bind more at one place than another. It is necessary to allow greater clearance for the band permitting the wheel to run free. In equalizing turn the wheel around a complete revolution (with brake applied slightly) and adjust so that at any point it will not exceed the resistance of the wheel on the other side. This will reduce tendency to lock when the other side is holding a little.

Sometimes you hear drivers say that their brakes tighten up on a long hill and will not release completely but after a time will become normal again. This is due, no doubt, to the spring clips on a Hotchkiss drive being slightly loose and allowing the axle to work back a small amount and consequently tighten up the brake rigging. After the car has run with power some distance the thrust works the axle forward again and the brake rigging assumes its normal position. The remedy is to tighten the spring clips.



By Wellington Gustin

#### PENNSYLVANIA SUPREME COURT DISCUSSES THE GARAGE AS AN OFFENSIVE BUSINESS

The garage as a nuisance was recently the subject of investigation by the Supreme Court of Pennsylvania in an injunction proceeding restraining a garageowner from operating a public garage in violation of a covenant in a deed, which covenant ran against "any noxious or offensive trade, business, or employment, to the hurt, damage or annoyance of others." 112 A. R. 236.

The garageman contemplated erecting a building to be used and operated as a public garage, when a preliminary injunction was issued against him. The Supreme Court stated that a garage was not a nuisance in itself, as is a glue factory: and a lawful business can never be a nuisance in fact or in anticipation if it is carried on reasonably and with due regard for the health and peace of others. A public nuisance affects all members of the public alike while a private nuisance affects some particular person. The former is not dependent upon covenants—acts that are against the well being of the particular community, and the difference in them rests on whether the nuisance affects the general public or merely some private individual.

#### Depends on Locality

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A public garage has been determined to be a nuisance in a residential district and this would be the case whether it was in violation of a building restriction or an annoyance to the general community. Such garage would not, however, be a nuisance in a section devoted to business purposes. Where a section is partly residential and partly business, there is uncertainty as to the status of the garage. Referring to the conditions arising from the operation of a public garage, it was shown that automobiles blowing their horns, constantly passed in and out of the garage during the day and night; engines were tested, with the motors running at varying rates of speed; carbureters were adjusted, backfiring, engines raced in starting, traffic was blockaded, hammering on iron could be heard some squares away, and grease and oil ran on the pavement.

Disagreeable odors were given out, offensive and dangerous, as burned gas and oil and oil in smoke were emitted from engines during their adjustment. Again, the sidewalk was blockaded by automobiles going in and out of the garage, and mechanics, chauffeurs and

#### At Your Service

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily under-stood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted to him.

others would congregate in large numbers on the street at the garage. Such invasions and encroachments gradually force the home owner in a residential district to seek residence elsewhere, said the court. These facts were sufficient to show the business of the garage was such as prohibited in the deed covenant. There may be cases, said the court, where the building restriction as in the deed covenant, has ceased to be of any advantage, as where there have been permitted various encroachments of businesses, and in such cases, the courts will not interpose and retard improvements simply to enforce the literal observation of a condition or covenant.

In the case on trial, however, the court said there was no such change in the neighborhood to justify a considering the restriction of the deed at an end. A great many of the houses are still in the hands of the original owners or their descendants and though two or three are occupied by tenants, this should not destroy their residential character. would be unwise to permit the extension of these business houses or to permit acts which would ultimately force a change in a restricted locality against the dominant owner's' wishes.

#### Case Difficult to Decide

It so appears that whether a garage may be erected and maintained in a particular locality is never easily determined where that locality is only partly devoted to business. Each case rests on its own

That a garage would hurt or damage other property owners the court upheld this declaration; " \* \* \* the storage of a sufficient amount of gasoline to serve the patrons of a garage of this size, the

# Using Mails to Defraud

On Nov. 15, 1920, I gave an order to company for a radiator shutter for a Buick car and enclosed a check for \$7.32, the full price. They accepted the order and cashed the check and said it would be shipped in a few days. After waiting a long time I wrote them about it and they replied on Dec. 13, 1920, that they had been having trouble getting them, but said that they had one of better quality that they would had one of better quality that they would send instead and would send it at the same price. After waiting a long time I wrote them again on Dec. 30, and did not get a reply. I wrote again Jan. 29, 1921, and gave them until Feb. 10 to fill the order or send the money back. I wrote them again March 19 and called for my money and have never had an answer to any of my letters. What can I do about it?—Stewards Garage, Twin Brooks,

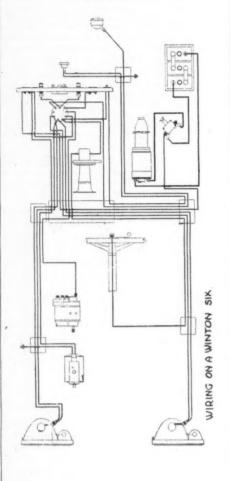
When one has used all means to secure or preserve his rights within his own powers and knowledge and has failed, the only recourse left is to seek the aid of courts of justice. But, ordinarily, courts are expensive to litigants and where the amount involved is small, their expense prevents the redress of one's minor grievances. Of course, you could place the account for collection, and bring suit, if necessary, recovering judgment for the money sent and court costs. A judgment might be incollectible and it might be throwing good money away for bad.

Now there is another angle to your case that might be pursued if the facts should show that this firm was using the U. S. mails to defraud. A Federal prosecution would lie, and action should be taken for the benefit of others. Sometimes the local postmaster will see to it that advertisers are investigated as to the legality of their business where they are using the U.S. mails.

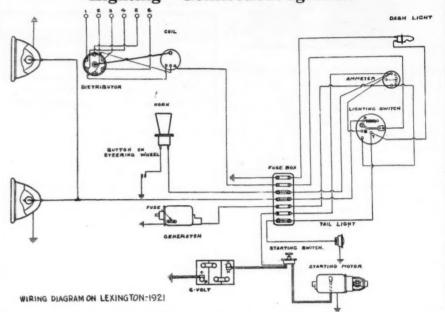
storage of automobiles, the keeping of the quantities of oil necessary for the operation and lubrication of the automobiles, smoking by attendants and others, the use of electric current near the gasoline and oils, the adjusting of carbureters, replacing of tires, moving and washing of the cars at night, back fire of motor cars, explosions of gasoline, will all result in added danger from conflagration, all of which will have the effect of reducing the values of the properties surrounding the garage and will tend to the removal of the tenants presently living in the neighborhood. It will increase the rates of insurance, will impose additional burdens upon the surrounding properties and will decrease the net return therefrom.

# Motor Age Weekly Wiring Chart No. 129

## 1921 Winton—Bijur System



# 1921 Lexington—Gray & Davis Starting and Lighting—Connecticut Ignition



DISTRIBUTOR
CENERATOR
CENERATOR
CITY CITY CITY CITY CITY CONNECTIONS TO LAMPS

WIRING DIAGRAM ON NASH-1921

#### Name of Car and Date on Which Wiring Diagrams Have Appeared in Previous Issues

Name of Allen—Sept. 30, '20
American Beauty—Feb. 17, '21
Buick—Dec. 23, '20
Cadillac—Nov. 18, '20
Case—Oct. 7, '20; Feb. 17, '21
Chalmers—Feb. 24, '21
Cleveland—Feb. 24, '21
Cleveland—Feb. 24, '21
Cole—Dec. 9, '20; Jan. 6, '20; Jan. 20, '21; May 5, '21
Daniels—Feb. 17, '21; May 12, '21
Dodge—Sept. 23, '20
Dorris—Dec. 9, '20
Feb. 24, '21
Elcar—Oct. 28, '20
Dec. 2, '20

Additional

Date on Which Wiri

Elgin—Oct. 14, '20
March 17, '21
Elkhart—March 3, '20
Franklin—Dec. 2, '20
Gardner—April 14, '21
May 19, '21
Grant—Nov. 25, '20
March 31, '21
Hudson—Jan. 13, '21
Hudson—Jan. 13, '21
Hupmobile—Feb. 3, '21
April 14, '21
Jackson—March 17, '21
Jordan—March 17, '21
Jordan—March 10, '21
King—March 3, '21
Kinsel—Oct. 21, '20
Apr. 28, '21
Kinekar—April 14, '21
Lexington—Dec. 16, '20
Locomobile—May 5, '21
Diagrams May Be Fo

ams Have Appeared i

McFarland—March 24, '21

Mercer—March 24, '21

May 12, '21

Mitchell—Jan. 6, '21

Apr. 21, '21

Moore—Nov. 1, '20

Moline-Knight—Nov. 4, '20

Monitor—March 31, '21

National—Dec. 16, '20

March 10, '21

May 12, '21

Oakland—March 24, '21

Oldsmobile—Apr. 21, '21

Dec. 23, '20

April 28, '21

Packard—Oct. 7, '20

March 31, '21

Paige—March 10, '21

Peerless—Nov. 18, '20

March 3, '21

the Readers' Clearing

Pierce-Arrow—April 21, '21
Premier—Feb. 10, '21
Reo—Feb. 10, '21; May 19, '21
Roamer—Sept. 30, '20; Dec. 30, '20; Feb. 10, '21
Saxon—Oct. 21, '20
Dec. 30, '20
Scripps-Booth—Feb. 3, '21
Sheridan—Feb. 3, '21
Stearns—Nov. 4, '20
Jan. 13, '21; May 5, '21
May 19, '21
Stephens—Jan. 13, '21; May 5, '21; May 19, '21
Studebaker—Oct. 28, '20
Templar—April 28, '21
Velie—Jan. 20, '21
Willys-Knight—Oct. 14, '20
Perim This Issue

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Additional Wiring Diagrams May Be Found in the Readers' Clearing House in This Issue

# Passenger Car Serial Numbers

# Motor Ag Maintenance Data Sheet No. 151

One of a series of weekly pages of information valuable to service men and dealers—save this page

REGAL	SCRIPPS-BOOTH (Continued)—
Year Model Cyls. Price Serial Numbers	Year Model Cyls, Price Serial Numbers
1912 N 4 \$900 2201-5100 L 4 1000 2101-3000	Number plate on heel board, right hand seat
H 4 1400 301-450 1913 T 4 950 5101-7700	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
C 4 1250 1-450	6-41 6 1985 11432-11599
1914 T 4 1400 451-600 4 1125 7701-9000	6-42 6 1985 11434-11599 Number plate on seat board un-
C 4 1350 453-600	der front seat cushion 1919 G 4 1065 1801-3000
1915 D 4 1085 10171-11254 1916 E 4 650 3074-3525	6-39 6 1295 11600
D 4 985 11255-11550 F-8 8 1200 244-550	Number plate on right seat heel board
1917 J 4 695 24382 up Discontinued. Number on left hand frame	e mem- 6-40 6 1295 11600-18759 6-41 6 1985 11600-12432
ber at spring.	6-42 6 1985 11600-16419
777	A-41 6 2175 16420 up A-42 6 1995 18410 up
REO Sala Prince Gariel Name	1920 B-39 6 20001 up Number plate on seat board un-
Year Model Cyls. Price Serial Numbers 1912 R-5, ST-5 4 \$1055 36001-42000	der front seat cushion
1913 R-5, ST 4 1095 42001-52000 1914 R-5, S-5, D 4 1175 52001-64000	SENECA
1915 R-5, S-5, L 4 1050 64001-76000 M 6 1385 101-2100	Year Model Cyls, Price Serial Numbers
1916 R-5, S-5 4 875 76001-96000	1917 A 4 \$735-850 500-1000 1918 D 4 1000-2000
M, N 6 1250 2101-10200 R-5, S-5 4 875 96001 up	1919 H 5 1920 L 4 1185 2001 up
M, N 6 1150 10201 up 1918 M 6 1385 20100 up	Number plate on 1917 models on
1516 M 0 1505 20100 up	dash under hood. On 1918 and 1919 models on dash under hood
ROAMER	and on left frame rail in front of radiator
Year Model Cyls. Price Serial Numbers 1916 All 10500-13500	SIMPLEX
1917 All 6 13501-15750	Year Model Cyls. Price Serial Numbers
1918 All 4 & 6 13751-16970 1919 All 6 16971 up	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
1920	90 4 6450)
DASS	1914 A 4 5600 1311-1498 D 4 6100
ROSS Year Model Cyls. Price Serial Numbers	1915 1499-2079
1916 A 8 \$1350 1003-1495	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
1917 C 8 1550 1496-1721 Discontinued	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
SIVOY	Discontinued Number on dash plate
SAXON Year Model Cyls. Price Serial Numbers	SINGER
1915 A 4 \$395 100-9740	Year Model Cyls. Price Serial Numbers 5751-760
A-2 4 395 101-519 B 4 395 10102-15082	7500-7600
B-2 4 395 342-735	1916 6
S 6 785 101-4843 1915-16 14 4 395 101-9574	77100-77902
S-2 S-2-R 6 835 5101-19199 835 101-2100	18905-18999
1917 B-5-R 4 495 9601-X20543 B-6-R 4 495 X1-X128	1919 6 19000-19940 12 20101 up
B-7-R 4 495 X790-X1222 1917-18 S-4-T 6 1045 19201-X40602	Number on front spring front horn bracket.
S-4-R 6 995 2101-X5192	
1918 Y-18-R 6 1195 101	SKELTON
Y-18-T 6 1195 1201 1919 Y-18-T 6 1295 7650 up	Year Model Cyls. Price Serial Numbers 1920 35 4 \$1245 500 up
Y-18-R 6 1295 1031 up	
1920	STANDARD Colo Polos Godel North
SAYERS	Year Model Cyls. Price Serial Numbers 1916 E 8 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
Year Model Cyls. Price Serial Numbers 1918 P 6 \$1695 5100-5300	1917 F 8 2450 C100-599
1919 A-P 6 1745 5301-5700 B-P	1918 G 8 2750 600-1099 1919 H 8 2750 1100-1599
1920 C-P 5701 up	1920 8 3000 1600 up
Number on left side of co	Number plate on dash; engine numbers on crankcase
SCRIPPS-BOOTH	STANLEY  Voor Medel Cyle Price Soriel Numbers
Year         Model         Cyls. Price         Seria. Numbers           1915         C         4         \$775         101-3100           1916         C         4         825         3101-7260	Year Model Cyls, Price Serial Numbers 1915 720 & 721 2 \$1975 15001-15999 1916 725, 726 \{\} 2 2200 46001-16999
D 8 1175 101-800	727, 728 1
1917 C 4 935 7261-8146 D 8 1285 801-1807	1917 728 & 730 2 2200 17001-17999 1918 735 & 736 2 2800-
1918 G 4 935 6-800 4 1065 801-1800	1920 735 , 2 4275 18001-18999
H 8 1285 2-325	19001-19959
	Number on chassis frame

# **Specifications of Current Passenger Car Models**

NAME AND MODEL	En- gine Make	Cylinders: Bore and Stroke	WB	Tires	2- Pass-	5- Pass.	7- Pass.	Coupe	Sedan
ce		6-31/4x5				\$2975 2975		\$3680 3680	\$3680 3680
ceL	H-S	6-33/8x5 6-31/4x5	116	32x4 32x4	2975	2260			2395
llenSeries 43	Own	4-31/2x5 6-35/x51/4		32x4 33x5	11395	1395 †4500	\$4500		2395 6500
mco1921	H-S	6-35/8x51/4 4-31/2x5	114	31x4	2395	2395	2475		3495
merican C	Cont.	6-314x5 6-314x41/2		32x4 33x4	2195	1795	1845	2795	2795
pperson 8-21-S pperson Anniversary	Own	8-31/4x5	130	34x41/2		13500	3500 4250	4500	4500
pperson Anniversary uburn 6-39	Own.	8-31/4x5 6-31/4x41/2		34x4½ 33x4	1745	†4250 1695	†1695	2795	2795
907	0			33x4	1885	1885		2785	2885
leggs	H-S	6-314x41/2 4-31/3x5 6-31/4x5	114	31x4		1495			
ell6-50	H-S Buda	6-31/4 x 5 4-33/4 x 51/2		32x4 32x4	3475	1695 3475			3975
irch Super-Four	H-S	4-3 <sup>3</sup> / <sub>4</sub> x5 <sup>1</sup> / <sub>2</sub> 4-3 <sup>1</sup> / <sub>2</sub> x5 4-3 <sup>1</sup> / <sub>8</sub> x4 <sup>1</sup> / <sub>2</sub>	117	33x4 30x3½	1345 1195	1345 1195	†1395	2295	2295
irch Light Six	H-S	6-31415	117	33x4	1695	1695			
Sour-Davis218 Frewster91	Own.	6-3½x5¼ 4-4 x5½	126 125	$33x4\frac{1}{2}$ $32x4\frac{1}{2}$	†7900	†1745 9000	2585	2495	2495 10500
riscoe	Own	4-38/8x5	109	31x4	1285 395	1285		1885	1885
rewster91  riscoe4-34  rookS-21 A  suick21-44-5-6-7  suick21-48-9-50	Own	2-3½x3½ 6-3¾x4½	90 118	28x3 33x4§	1795	1795		2585	2895
luick 21-48-9-50	Own	6-3 <sup>8</sup> / <sub>8</sub> x4 <sup>1</sup> / <sub>2</sub> 6-3 <sup>8</sup> / <sub>8</sub> x4 <sup>1</sup> / <sub>2</sub> 4-3 <sup>1</sup> / <sub>2</sub> x5	124 116	34x4½ 33x4		1245	2065	2985	3295
Bush E.C.4	Rut	6-31/8x5		33x4		1575		2050	2150
			125	34x4½		†3790			4950
adillac	Roch	8-3½x5½ 6-3½x5	132 128	35x5	3985	3985	3940		5190
	Roch	6-3½x5	128		3185	3185			
ase	Cont	6-31/2x51/4 6-31/4x41/2		34x4½ 32x4	1795	1795	2650 1945	3400 2595	3750 2745
halmers 6-30	Own	6-314x41/2	122	33x41/2			1945		
halmers. 6-30 halmers. 6-30 hampion. Tourist hampion. Special handler , Six	H-S	4-3½x5 4-3½x5	113 118	32x3½ 32x4	†1595	1250 1595		2222	
Chandler , Six Chevrolet	Own	6-3½x5 4-3½x4	123 102	33x4 30x3½	1930 635	†2010 645	1930	2930 1155	3030 1195
hevroletFR	Own.	4-314x514	110	33x4	1320	1345		2075	2075
Towaland 40	Own:	6-3 x4½ 4-3½x5	112	32x4	1465 1550	1465 1550		2375	2475
Climber Four	H-S	6-31/4×5	1251/2	32x41/2	2750	2750	3250	4250	4450
Cole	Cont.	$8-3\frac{1}{2}x4\frac{1}{2}$ $6-3\frac{1}{4}x4\frac{1}{2}$	127 115	33x5 32x4	3250 1945	†3250 1795	1995	2895	2895
Comet	Cont.	$6-3\frac{1}{2}x5\frac{1}{4}$	125	33x4½		2350	2450		3650
		6-316x514	117 1221/2	32x4 32x4	3000	1595 3000			2465 4500
Crawford 21-6-40 Crow-Elkhart L63-65 Crow-Elkhart S63-65	Lyc	4-31/2x5 6-31/4x5	117	32x31/2		1295		****	
Crow-Elkhart S63-65 Cunningham V-4	Own	6-31/4x5 8-33/4x5	117 142	33x4 35x5	33x5	1545	****		2395
			132			†5350	5350	6250	6950
Daniels	Cont.	6-31/4x41/2	120	34x4½ 33x4	11995	1895	†2150	2795	2795
Dispatch	H-S.	4-38/4x5 4-31/2x5	120 112	34x4 32x4	1290 1595	1350 1595	1350	1525 2570	1575 2570
Dispatch	Own	4-37/8x41/2	114	32x31/2	1235	1285	4785	1900	2150
Derris6-80 Dert17-12	D-Ly.	6-4 x5 4-31/2x5	132 108	33x5 31x4	1215	†4785 1215	4/80	5800 1865	6690 1995
Dodge Brothers	Own	4-3  x51/8		32x4½		†3400	.,,		4900
Flore K-4	Lve	4-316x5	117	33x4	1300	1300			
Elcar	Cont.	6-314x412 6-318x414	117	33x4	‡1700 †1895	1700 1775	****	2500 2795	2600 2795
Elgin	Own.	4-33/8x4	1081/2	33x4 32x4	1595	1595		2100	2450
			126	33x41/2		Chassi	s Price	10000	
Fergus S-5-21 Ferris Tord T	Cont.	6-31/2x51/4	130	32x41/2 30x31/2	3.3350	440	*3350	745	4100 795
Franklin 9-B	OWn	0-314X4	115	32x4	2700	2800	†2750		3850
Friend Four		4-31/4x41/2	112		11285	1285		1985	2085
GlobeB-10	Supre.	4-33/8x5 6-31/3x41/2	115 116	32x4 32x4	1550	1550		2450	2450
GrantSix GardnerG	Lyc	4-31/2x5	112	32x31/2	\$1195	1195		2400	2145
	1	6-31/4×5	116	33x4		2285			
Halladay		4-41/8x41/2	125	32x41/9			2985		418
Hansen Six60	Cont	4-418x412 6-314x412 2-312x4 4-314x514	121 90	32x4 28x3	2185	2185	†2285		316
Harroup A-A-2	Own	4-314x514 4-31/2x5	106 115	30x31/2 32x4	1695	1195 1695		1	259
Hatfield	Own	6-31/6x5	132	34x41/2		†2935	2935		4250
Haynes 48	Own		121 132	33x4 34x41/	4200	1985 †3635	3635		495
stayires	Cone.	0-0% 3472	120	32x4	1795	1795			277
Huffman	Weid.	4-35/8x51/2 6-31/2x41/4	126	32x41/3	2 3350	†2975	3350	3650 4250	4550
H.C.S	Own	0-0728474	1 100	34x41/	2 72400	1485	2400	3275	3400 248
Huffman	Own	0"02280	126			1 1200	****	2400	1
Huffman. H.C.S. HolmesSeries 4 Hudson Super 6 HupmobileSeries R	Own Own	4-31/4x51/2	112	32x4	1485				
Huttman. H.C.S. Holmes Series 4 Hudson Super 6. Hupmobile Series R	Own Own Own	4-314x51/2 6-314x41/6	112	32x41/	12685	1950	9475	3760	376
Huttman. H.C.S. Holmes Series 4 Hudson Super 6. Hupmobile Series R	Own Own Own Cont	6-314x41/2 6-314x41/2	112 121 120		†2685 2250		2475 2875	3760 3300	330
Hultman. H. H. C.S. Series 4 Hudson Super 6. Hudson Super 6. Series F Jackson. 638 Jerdan. M. Jerdan. I. Jerdan. I. Jerdan. II. Jerdan. II. Jerdan. II. Jerdan. III. Jerdan. I	Own Own Own Cont Cont	6-314x41/2 6-314x41/2 6-314x41/2 6-31/2x51/4	112 121 120 127	32x41/32x41/32x41/32x41/32x4	†2685 2250  1800	1950 2250 	2875	3300	270
Hultman. H. H.C.S. Series 4 Hudson Super 6. Huldson Super 6. Hupmobile. Series F Jackson. 633 Jordan. N Jordan. I Kelsey. GI Kenworthy. 8-90	Own Own Cont Cont Cont Cont Cont Own	6-314x41/2 6-314x41/2 6-314x41/2 6-31/2x51/4 6-31/2x51/4	112 121 120 127 1181 130	32x41/32x43/232x41/32x41/2	†2685 2250  1800	1950 2250  1800 5000		3300 2700 6000	270 600
Hultman. H.H.C.S. Series 4 Hudson Super 6. Hulmobile. Series 6 Jackson. 633 Jordan. N.Jordan. I.K. Kelsey. GI Kenworthy. 8–90 Kessler K	Own Own Own Cont Cont Cont Cont Own Own Own Own	6-314x51/2 6-314x41/2 6-314x41/2 6-31/2x51/4 6-31/2x51/4 8-3 x51/4 8-3 x51/4 8-3 x5	112 121 120 127 1181 130 117 120	32x4 32x4 32x4 32x4 32x4 32x4 32x4 32x4	1800 5000 2740	1950 2250  1800 5000 1995 †2725	2875 5250 •2725	2700 6000	270 600 244 403
Hultman. H.H.C.S. Series 4 Hudson Super 6. Hulmobile. Series 6 Jackson. 633 Jordan. N.Jordan. I.K. Kelsey. GI Kenworthy. 8–90 Kessler K	Own Own Own Cont Cont Cont Cont Own Own Own Own	6-314x51/2 6-314x41/2 6-314x41/2 6-31/2x51/4 6-31/2x51/4 8-3 x51/4 8-3 x51/4 8-3 x5	112 121 120 127 1181 130 117 120 124	32x4 32x4 32x4 32x4 32x4 32x4 32x4 32x4	1800 5000 2740 3475	1950 2250 1800 5000 1995 †2725 †3475	2875 5250 *2725 2775	2700 6000  4275	270 600 244 403 427
Hultman. H. H.C.S. Series 4 Hulson Super 6. Series 6 Hupmobile. Series 6 Hupmobile. Series 8 Jackson. 633 Jordan. N. Jordan. I. Kelsey. GI Kenworthy. 8-90 Kessler King. King. Kinsel. 44 Kline Kar. 6-55-8 Kurtz Automatic.	Own  Cont  Cont  Cont  Cont  Cont  Own  Own  Cown  Cown  Cont  Cont  Cont  Cont	6-314x4½ 6-314x4½ 6-314x4½ 6-314x4½ 6-314x4½ 6-314x5¼ 6-314x4½ 8-3 x524 8-3 x524 6-314x4½ 6-314x4½	112 121 120 127 1183 130 117 120 124 121 122	32x4 32x4 32x4 32x4 32x4 32x4 32x4 32x4	1800 5000 2740 3475 2290	1950 2250 1800 5000 1995 †2725 †3475 2290 2250	2875 5250 *2725 2775 2290	2700 6000 4275 3250	270 600 244 403 427 329 300
Hultman. H.H.C.S. Series 4 Hudson Super 6. Hupmobile. Series F Hupmobile. Series F Jackson. 633 Jerdan. M. Jerdan. M. Kelsey. GI Kenworthy. 8–90 Kessler F King Missel. 44 Kline Kar 6–55-K Kurtz Autematic. 13	When the control of t	6-314x41/2 6-314x41/2 6-314x41/2 6-314x51/2 6-314x51/2 6-314x51/2 6-314x51/2 6-314x51/2 6-314x51/2 6-314x51/2	112 121 120 127 1181 130 117 120 124 121 122 132	32x41 32x4 32x4 32x4 32x4 32x4 32x4 32x4 32x4	1800 5000 2740 3475 2290 5625	1950 2250 1800 5000 1995 †2725 †3475 2290 2250 5625	2875 5250 *2725 2775 2290 5625	2700 6000 4275 3250 7200	270 600 244 403 427 329 300
Hultman. H.H.C.S. Series 4 Hulson Super 6. Hulgon Super 6. Hulgon Super 6. Series R. Jackson. 631 Jerdan. M. Jordan. N. Jordan. M. Kelsey G. G. Kenworthy. 8–9 Kessler M. King M. King M. King M. King M. Jordan.	When the control of t	6-314x41/2 6-314x41/2 6-314x41/2 6-314x51/2 6-314x51/2 6-314x51/2 6-314x51/2 6-314x51/2 6-314x51/2 6-314x51/2	112 121 120 127 1181 130 117 120 121 121 122 132 128 122	32x43 32x4 32x4 32x4 32x4 32x4 32x4 33x4 33	2 †2685 2250 1800 5000 2 2740 3475 2290 5625 2 \$5700	1950 2250 1800 5000 1995 †2725 †3475 2290 2250	2875 5250 *2725 2775 2290 5625 5700	2700 6000 4275 3250 7200	270 600 244 403 427 329 300 740
Hultman. H.H.C.S. Series 4 Hulson Super 6. Hulymobile. Series 8 Hugonobile. Series 8 Jackson. 638 Jerdan. 1. 1 Kelsey. GI Kenworthy. 8–96 Kenworthy. 8–96 Kenworthy. 8–96 Kessler & King Missel 44 Kline Kar 6–55–K Kurtz Automatic. LaFayette. 13 LaFayette. 13 Laesch. 21–A–B & Lexington Series 1	GOWN.	6-314x412 6-314x412 6-314x412 6-314x412 6-314x514 8-3 x514 8-3 x52 6-314x51 6-314x51 6-314x51 6-314x51 6-314x51	112 121 120 127 1181 130 117 120 124 121 122 132 128 128 128	32x43 32x4 32x4 32x4 32x4 32x4 32x4 32x4	1800 5000 2740 3475 2290 5625 25700	1950 2250 1800 5000 1995 †2725 †3475 2290 2250 5625 5200 2285	5250 *2725 2775 2290  5625 5700	2700 6000 4275 3250 7200	270 600 244 403 427 329 300 740
Hultman. H. H.C.S. Series 4 Hudson Super 6 Hupmobile. Series 6 Jackson. 633 Jordan. N Jordan. I Kelsey. GI Kenworthy. 8–90 Kessler King. King. Kinsel. 44 Kline Kar. 6–55–8 Kurta Automatic.	When the control of t	6-314x5) 6-314x4) 6-314x4) 6-314x4) 6-314x4) 6-314x34 4-354x34 8-3 x5) 6-314x4) 6-314x5) 6-314x5) 6-314x5 6-314x5 6-314x5 8-34x5 8-34x5 8-34x5 8-34x5 8-34x5	112 121 120 127 1181 130 117 120 124 121 122 132 128 128 128	32x43 32x4 32x4 32x4 32x4 32x4 32x4 33x4 33	2 †2685 2250 1800 5000 2 2740 3475 2290 5625 2 \$5700	1950 2250 1800 5000 1995 †2725 73475 2290 2250 5625 5200 2285	2875 5250 *2725 2775 2290  5625 5700 2985 †1885 4600	2700 6000 4275 3250 7200 2825 5750	270 600 244 403 427 329 300 740  335 425 285

NAME AND MODEL	En- gine Make	Cylinders: Bore and	WB	Tires	2- Pass.	5- Pass.	7- Pass.	Coupe	Sedan
Maibohm   B   Marmon   34   Maxwell   25   McFarlan   1921   Mercer   Series 5   Merit   Motor   R &RR   Metz   M6   Mitchell   F-40   Mitchell   F-42   Moller   A   Monitor   B50-52   Monroe   S-9 & 10   Monroe   S-11 & 12   Monroe   S-11 & 12   Monroe   S-14 & 12   Monroe   S-15   Monroe   S-16 & 18   Monroe   S-16 & 18   Monroe   S-16 & 18   Monroe   S-17 & 18   Monroe   S-18 & 18   Murray-Mac Six   Maxwell   Maray-Mac Six   Maxwell   Maxwel	Falls Own Own Own Own Cont Dues Rut	4-41/4x6 6-31/8x5	140 132 119 129 120 120 127	32x4½ 30x3½ 33x5 32x4½ 32x4 32x4½ 32x4½	2245 5500 1995 1750 2000 1440 2285	\$1575 †3985 995 995 †6300 †4500 †2245 5500 1995 1750  1850 1410  2185 4250	†1750 3985 6300 *4500 †1950 1995	\$2395 4875 1595 7500 5700  2795 2800  2400 3185	\$2395 5275 1695 7500 6200  2895 2900  2500 3185
Nash.         681-7           Nash         682           Nash Feur.         41-4           National Sextet.         BB           Nelson.         D           Noma.         1C           Northway.         Norwalk.           430-KS	Own Own Own Own Own Cont;	6-314x5 6-314x5 4-314x5 6-312x514 4-318x434 6-314x412	121 127 112 130 104 128 128 116	33x4 34x4½ 32x3½ 32x4½ 32x4 32x4 32x4½ 33x5 32x3½	1695 1395 3750 3000 4200	1695 1395 †3750 1900 3200 *4200 1285	†1850 1875 3750  6000	2650 1985 4900  5600	2895 2185 4950 4450 5400
Oakland 34-C Ogren 6-60 Oldsmobile 43-A Oldsmobile 377 Oldsmobile 40 Oldsmobile 40 Overland 6	Own Own Own Own Own	6-31/2x51/4 4-31/1x51/4 6-21/1x48/4 8-27/8x48/4 8-27/8x41/2 4-38/8x4	115 134 115 112 122 115 100	32x4 32x4 33x4½ 32x4 30x3½	895	1145 3750 1445 1450 †2100 †1695 895	3900	1815 5000 2145 2145 2395 1425	1815 5400 2145 2145 3300 2395 1475
Packard   Single	Own. Own. Own. Own. Own. Own. Own. Cont. Own. Own. Own. H-S. Own. Own. H-S.	12-3 x6 6-314x5 6-314x5 4-314x5 6-314x5 8-224x414 6-314x415 2-312x5 4-312x5 6-314x415 6-314x5 6-314x5	90 116 122	33x4 33x4 32x4 33x4 34x41 28x3 32x31 32x4 35x5 32x41 35x5	8000 385 385 8000 2285 6750 4600	2975 *6000 1795 1500 2250 2000 1895 †2990 1395 †7500 2285 Chassi †4600 1295	7500 2335 8 Price 4600	2895 3680 3680 3680 3680 3600	4250 8450 2720 3850 2895 3950 9000 3600
Raleigh . A-6-6/ Ranger . A-2/ R & V Knight . F R & V Knight . F Revere . C Roamer . 6-54-1 Romer . Rock Falls . 1400 Rolls-Royce .	Own. Own. Own. Own. Own. Dues. Cont. Cont.	6-3½x5 4-3½x5 4-3½x5 6-3½x4½ 6-3½x5 4-3¾x6 6-3½x5 6-3½x5 6-3½x5 6-3¾x5	132	32x4 <sup>1</sup> / <sub>2</sub> 32x4 32x4 32x4 <sup>1</sup> / <sub>2</sub> 33x4 32x4 <sup>1</sup> / <sub>2</sub> 32x4 <sup>1</sup> / <sub>2</sub> 32x4 35x5 33x5	1850 4850	2750 2150 †3350 1850 4650 	3350 †4650	3600 2850 4000 2700  11750	3700 2950 4200 2750 6500
Saxon. 12: Sayers Siz Df Scripps-Booth. B-39-4: Seneca L & C Severin Si Severin Si Sheridan Sheridan Sheridan Skelton 3 Southern Six 660- Standard Stanley Steamer Stanwood Six Stephens SKL Stephens SKL Stephens 9 Stevens Duryea Studebaker EJ-4 Studebaker EJ-5 Studebaker EG-6 Stutz	Nort. Lyc. Lyc. H-S. Own. Own. Cont. Own. Own. Own. Own. Own. Own. Own. Own	8-31/2x41/2 4-31/2x5 6-31/4x5 8-31/4x5 2-4 x5 6-31/4x41/2 4-33/4x5/6 6-31/4x41/2 6-31/2x41/2 6-31/2x5 6-31/2x5	108 122 122 116 132 112 127 127 130 118 125	32x4 33x4 33x4 33x5 33x5 32x3 32x3 32x4 33x5 32x4 33x4 33x4 33x4 33x4 33x4 33x4 33x4	1485 2550 1685 1295 2875 3400 2050 2550 2400 8500 1750	1295 2875 13400 3950 2050 2450		2950 3400 3400 9500 2650	4500 5775 2950 3700 3400 9500 2150 2750
Templar       A-44         Texan       A-3         Texan       C-1         Tulsa       E-1-2-	8 Lvc.	1 4-31-5x5	118 115 115 1171	32x4 33x4 33x4 33x4	2885 1195 1350 1385	2885 1195 1350 1385	†2885	3785	
Velie	4 Falls. 5 H-S 6 Cont. Fal's. Wise. 8 Cont. Cont. Own. 0 Own. 1 H-S	6-31/4x5 6-31/4x5 6-31/2x5)/4 6-31/2x5)/4 6-31/2x5)/4 6-31/2x5)/4 6-31/2x5)/4 8-4 x5 8-31/4x4 4-35/8x41/2 6-31/4x5	121 118 120	32x4 32x3 32x4 33x4 33x5 32x4 33x4 33x4 33x4 32x4 33x4 32x4 33x4 32x4 35x5	2290 2290 22195	†4885 3200 2195	†2200 2360 2560 2990 4885	3050 3250 3390 2845	2485 3050 3250 4590 3390 2945

\*-6-passenger. †-4-passenger. ‡-3-passenger. \*@-Special Body.
Engine Make: Cont—Continental. D.Ly—Dort Lycoming. Dues.—Duesenberg. GBS
-Golden, Belknap & Swarts. H-S—Herschell-Spillman. Lyc—Lycoming. Nort—Northway.
Roch—Rochester. Rut—Rutenber. Tee—Teetor. Wal—Walther. Wise—Wisconsin. Weid
-Weidely. LeR—Leroi. Curt—Curtiss. \$—Model 47—34x4½ Tires.

# **Specifications of Current Motor Truck Models**

			1		011			1	1 9	11				-		2
NAME AND MODEL	Tons	Chassas	Bore and Stroke		NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	TIRES Front Rear		NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	Front Rear	€ Final Driv
Acason, RB Acason, RB Acason, BA Acason, M Ace, C Ace, A Ace Acme, G Acme, G Acme, E Acme, C All-American, B-1 All-American, B-1 All-American, B-1 All-American, B-1 All-American, B-1 All-American, C-1 American, 25 American, 25 American, 25 American, 27 All-American, B-1 All-American, C-1 American, C-1 American, C-1 American, C-1 American, C-1 American, B-1 All-American, C-1 American, C-1 Bell, C-1 B	11235 14 4 4 4 5 4 1235 11124 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 11235 5 1 1 1 1235 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4250 4425 1100 820 1225 2450 2375 2750 2350 5500 1450 1450 1800 2150 2150 2150 2150 2150 2150 2150 21	33/4x5 4 x51 41/4x51 4 x51	36x5   36x5   36x5   36x6   36x5   36x5	W F.W.D., B W Front Drive C W Fulton, A W Fulton, C W Garford, 15 Garford, 25 Garford, 70-H W Garford, 150-A W Gary, F W Gary, F W Gary, J Gary, K Gary, M W G.M.C., 15 G.M.C., 15 G.M.C., 15 G.M.C., 15 C.—Chains, W Four-Wheel	d 332 5 2 2 1 1 1 1 2 2 2 1 1 1 2 2 3 3 2 2 3 4 1 1 4 2 2 3 3 2 3 4 1 1 4 2 2 3 3 2 3 4 1 1 4 2 2 3 3 3 2 3 4 1 1 4 1 2 3 3 3 2 3 4 1 1 4 1 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	4200 2800 1750 2350 2350 2350 2350 2350 2350 2350 2400 5200 5250 2100 2250 2150 2550 2550 25	434.55 33.45 33.45 33.45 33.45 43.45 33.45 33.45 33.45 33.45 33.45 43.45 33.45 43.45 33.45 43.45 33.45 43.45 33.45 43.45 43.45 43.45 43.45 43.45 43.45 44.45	35x5   36x6   35x5   36x6   35x5   36x5   36x5   36x5   36x6   36x6	GGGGGGGGGGCCCCCCCCCCCCCCCCCCCCCCCCCCCC	i.M.C., 41 i.M.C., 101 i.M.C.,	477714 4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	2950 2940 1665 2585 3285 4285 4285 2950 1500 2400 4500 2400 4550 2405 2405 2405 2	414x6 314x4 312x5 334x51 334x51 334x51 412x61 412x61 412x61 412x61 412x61 334x51	36x5   40x5d   36x7   36x5   36x6   36x6	WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW

# Specifications of Current Motor Truck Models—Continued

- 1		1110	ativ	0115 01		Gurren		110	101	HUCK		Models		<u> </u>		uou
NAME AND MODEL	Tons	Chassis Price	Bere and Stroke	TIRES Front Rear	Final Drive	NAME AND MODEL	Tons	Chassus	Bore and Stroke	TIRES Front Rear	Final Drive	NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	TIRES Front Rear
Kimball, AC Kimball, AE Kimball, AE Kimball, AE Kimball, AE Kimball, AE Kimball, AE Kissel, Express Kissel, Utility Kissel, Freighter Kissel, H. D. Kleiber, A Kleiber, B Koehler, MCS Koehler, J Koehler, MCS Koehler, B Kleiber, B Klei	23/2 3 4 5 1 1/2/2 4 1 1/2 2 1	3975 4500 5000 5975 1985†† 2775 3475 2600 4200 4200 4200 4200 4200 4200 4200	414 x 66 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	36x4   36x8   36x4   36x10   36x5   40x10   36x5   40x12   34x51   34x51   36x5   36x5   36x4   36x5   36x5   36x6   36x6   40x12   34x31   36x5   36x4   36x7   36x5   36x6   36x4   36x7   36x4   36x7   36x5   36x6   36x4   36x7   36x5   36x6   36x4   36x7   36x5   36x6   36x4   36x7   36x5   36x6   36x4   36x8   36x4   36x8   35x51   35x51   35x51   35x51   35x51   35x51   35x51   35x51   35x51   36x4   36x4   36x4   36x6   36x4   36x6   36x4   36x6   36x4   36x6   36x4   36x6   36x4   36x6   36x4   36x5   36x4   36x6   36x6	WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	O. K., L1 O. K., M1 O. K., M1 O. K., M1 O. M. M1 O. M. M1 Old Rickory, W Old Reliable, B Old Reliable, B Old Reliable, C Old Reliable, C Old Reliable, C Old Reliable, E Old Reliable, E Old Reliable, C Oneida, A-9 Oneida, A-9 Oneida, B-9 Orleans, B Orleans, B Orleans, B Orleans, B Orleans, B Orleans, B Orleans, C	21/2 33/2 11/2 23/2 5 7 1 12/2 33/2 11/2 23/2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3450 4250 2175 23500 4250 3500 4250 6000 3500 2350 2915 3390 2915 3494 4345 4345 4250 3750 4250 4250 4250 4250 4250 4250 4250 42	44x534 414x534 414x54 414x6 434x6	36x4 36x8 36x54 36x54 36x4 36x5 36x54 36x54 36x54 36x54 36x54 36x5 36x54 36x5 36x54 36x5 36x5 36x5 36x5 36x5 36x5 36x5 36x5	WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	Service, 71 Service, 76 Service, 76 Service, 76 Service, 10 Signal, NF Signal, H Signal, M Signal, R Southern, 15 Southern, 15 Southern, 15 Southern, 15 Southern, 26 Standard, 1-K Standard, 1-K Standard, 1-K Standard, 66 Standard, 65 Standard, 65 Standard, 65 Standard, 65 Sterling, 1½ Sterling, 2½ Sterling, 2½ Sterling, 5-C Sterling, 5-C Sterling, 5-C Sterling, 5-C Sterling, 7½ Sterling, 5-C Sterling, 7½ Sterling, 7-X Sterling, 5-C Sterling, 7-X Stevart, 10 Stewart, 17 Stewart, 7-X Stewart, 10	33351115335 112 114 14 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6	4285 4485 5275 2475 22925 3275 5300 2590 22590 22590 23500 3100 4000 5250 6000 6500 1250 2200 33500 33500 33500 33500 33500 33500 33500 34650 1850 2770 3300 4650 1850 1955 2350 2695 3650 4650 5650 5650 5650 5650 5650 5650 5	414x514 414	36x5 36x5d W 36x5 36x5d W 36x6 40x6d W 34x4 36x6 W 34x4 36x6 W 34x4 36x6 W 34x4 36x6 W 36x5 40x5d W 36x6 40x6d W 36x6 34x4 W 36x6† 34x5 W 36x6* 36x6 W 36x4* 36x7* W 36x6 W 36x6 W 36x4 S 36x6 W
Mack Trac., AC Mark Trac., AC Mapleleaf, AA** Mapleleaf, BB** Mapleleaf, CC** Mapleleaf, CC** Mapleleaf, CD** Master, JW Master, A Master, B Master, B Master, F Master, F Master Trac., T Mawwell, 1½ Menominee, H Menominee, D Menominee, D Menominee, J Moline, 10 Moreland, 20 N Moreland, 21 B	101 13 15 2 3 4 5 11 21 21 21 21 21 21 21 21 21 21 21 21	5750 6000 4150 4175 5770 6825 2690 3290 3540 4190 4640 5290 3245 4270 5450 22450 2450 2450 3125 3900 34975 5350 3450 4150 3150 3150 3150 3150 3150 3150	5 x6 4 4 4 x x 5 3 5 5 5 6 4 4 4 4 x x 5 3 5 5 5 6 4 4 4 4 x x 6 6 6 4 4 4 4 x x 6 6 6 4 4 4 4	36x6   40x12   36x7   36x7   36x4   36x5   36x6   40x64   36x5   36x54   36x6   40x64   33x5   40x54   35x5   40x54   35x5   40x54   35x5   40x54   35x5   36x7   36x7   36x7   36x7   36x8   36x8	C C W W W W W D W D W D I	Rainier, R20 Rainier, R17 Ranger, TK-20-2 Reo, F Reliance, 10A Rejublic, 10 Republic, 10Exp.†¹ Republic, 11X Republic, 11X Republic, 19 Republic, 20 Riker, B	21/2 5 5 2 11/2 21 1 11/2 21/2 33/2 4 11/2 33/2 33/2 33/2 33/2 33/2 33/2 33/2	3600 5250 3200 3200 1695 2795 3845 2795 3840 4800 3000 4500 3300 4150 2720 865 1395 2295 4975 3350 4200 5100 3350	41/2x0  38/4x5  41/4x84  4 x51/2  41/4x51/2  38/4x5  41/4x56  41/4x56  41/4x56  38/4x56  41/4x56	34x4   34x7     36x61   36x61     36x61   36x61     36x31   34x41     36x32   36x5     36x4   36x5     36x5   36x4     36x5   36x5     36x5   36x61     36x5   36x61     36x5   36x61     36x5   36x61     36x5   36x61     36x5   36x61     36x6   36x5     36x6   36x61     36x4   36x51     36x4   36x51     36x5   36x51     36x6     36x6	WWW B I I I I I I I I I I I I I I I I I	Titan, TS Tower, H Tower, G Tower, G Traffic, C Transport, 20 Transport, 30 Transport, 30 Transport, 70 Traylor, B Traylor, C Traylor, E Traylor, E Traylor, F Triangle, AA Triangle, AA Triangle, C Triangle, C Triangle, C Triangle, B Triumph, HB Triumph, G Twin City, B.W. Twin City, FWDA Ultimate, AJ Ultimate, AJ Ultimate, AJ Ultimate, BL Union, F W Union, J	21 1 2 2 2 2 1 1 2 2 2 2 1 1 2 2 2 2 2	3400 3000 3475 4400 1595 1850 2250 2250 3500 4700 1600 2350 2900 2950 2900 2950 2900 4400 3500 3500 3500 3500 3500 3500 35	44 x 55 y 44 y 2 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 3 4 x 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	34x4* 36x4 1 35x5 36x4 36x7 W 36x5 36x5 W 34x31* 34x5* 1 34x31* 34x5* 1 36x3 36x5 36x1 0 36x5 36x5 W 36x4 36x7 W 36x4 36x7 W 35x5* 40x10 W 35x5* 40x10 W 35x5* 40x10 W 35x5* 36x4 36x6* I 34x31* 34x6* I 36x4 36x7 W 35x5* 36x4 36x6* I 36x4 36x7 W 35x5* 36x6 W 35x5* 36x6 W 35x5* 36x6 W 35x5* 36x6 W 36x4 36x7 I 36x4 36x7 I 36x4 36x7 W 36x4 36x7 W 36x4 36x7 W 36x4 36x7 I 36x6 36x6 W 36x6 M 36x
Nash, Quad.  *Nelson, F1½  *Nelson, F2  *Nelson, F2  *Nelson, F3½  *Nelson FC5  Netco, D  Netco, H  New York, M  New York, M  Niles, E  Noble, B30  Noble, C40  Noble, E70  Noble, E70  Northway, B-2  Northway, B-3  Northway, B-2  Northway, B-2  Northwalern W  Nerwalk, 25E  Norwalk, 35E  Norwalk, 35E  Ogden, A1  Ogden, E  O, K., K1	2 11/2 2 31/2 5 5 2 21/2 2-21/2 2 2-21/2 2 31/2 2 31/2 2 31/2 2 31/2 3 3 3 3 1/2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3000 3500 2585 2825 3150 4030 3400 4400 3500 1695 2025 2285 2550 2675	41 (x5) 4 41 (x5) 4 41 (x5) 4 42 (x6) 4 42 (x5) 4 42 (x5) 4 43 (x5) 4 41 (x5	36x5 36x5 36x5 36x5 36x5 36x4 36x7 36x3 36x5 36x5 36x5 36x5 36x5 36x4 36x7 36x4 36x4 36x4 36x4 36x5 36x5 36x5 36x5 36x5 36x5 36x5 36x5	WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	Schwartz, BW Schwartz, C.W.S Schwartz, DW Selden, 1½A Selden, 2½A Selden, 3½A Selden, 3½A Selden, 5A Seneca, M20 Service, 15 Service, 31 Service, 31 Service, 31 Four-Wheel, †Pneumatic 7	11/2 21/2 5 11/2 21/2 31/2 5 1/2 11/2 21/2 21/2 11/2 21/2 11/2 21/2 11/2 21/2 11/2 21/2 11/2 21/2 11/2 21/2 1 1/2 1 1/2 1/2	uble R xternal	**Car Worm, eduction Genr. hers soli	36x5 40x6d 33x41½ 33x4½ 34x7* 36x4 36x8 36x6 40x12 34x31½ 34x5 36x6 36x7 36x6 36x10 36x6 40x12 34x31½ 34x5 36x3 40x12 34x31½ 34x5 36x31½ 34x5 36x31½ 34x5 36x31½ 36x6 35x6† 38x7† 36x4 36x7 hers, not mark haddan made. —Internal Ge B—Bevel, *Tires—option t†—Price several items	W W W W W W B W W W W W Aar, aar, aal.	United, C United, V U. S., N U. S., R U. S., E U. S., T Veteran, E** Veteran, A** Veteran, D** Veteran, H** Victor, A Vim, 29 Vim, 31 Vim, 23 Vulcan, 25 Vulcan, 25 Walkaer-Johnson, I Walter, S Waltham, E	21/2 31/2 3 4 6 11/2 21/2 1/2 21/2 3 21/2 21/2 3 21/2 3 21/2 3 3 21/2 3 3 21/2 3 3 3 4 3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	\$\\\ 4400\\ 5600\\ 2050\\ 1355\\ 2475\\ 3150\\ 4900\\ 4800\\ 3500\\ 2350\\	43/8x53/4	36x5 36x5d W 34x4 34x5 I 31x4† 31x4† W 35x5† 35x5† W 36x4 36x6 W 30x5 36x5d W 36x4 36x8 W 36x6 40x8 W

# Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	TIRES Front Re	Final Drive	NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	TIR	Rear E		NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	Frent	Rear	Final Drive
Ward-LaF., 5A Watson, R Watson, N Western, W11½ Western, L1½ Western, L2½ Western, W3½ Western, W3½ White, 15 White, 20 White, 40	5 1 31/2 11/2 21/2 21/2 31/2 31/2	5590 1865 4250 2550 2550 3250 3250 4250 2600 3450 4500	5 x614 334x514 412x512 418x514 334x5 418x514 414x6 334x518 334x518 334x518 334x518	36x6 36x3 34x4½† 34x 36x5 36x3 36x3½* 36x 36x4 36x 36x4 36x 36x5 40x 36x5 40x 36x5 40x 36x5 40x	41/2† W 110 W 15* W 15* W 17 W 17 W 15d W 15† B 17 D	Wichita, RX Wichita, O Wichita, S Wilcox, AA Wilcox, B Wilcox, D Wilcox, E Wilcox, F Wilson, F Wilson, EA	21/2 31/2 5 1 11/2 21/2 31/2 5 11/2 21/2	3600 4000 5000 2100 2775 3300 4250 5200 2650 3300	41/2x6 33/4x51/2 41/4x5 41/2x6 43/4x61/2 33/4x5	36x4* 36x5* 36x6 36x4* 36x4* 36x4* 36x5* 36x5* 36x5 36x3½	36x8* W 36x5d* W 40x6d W 36x4* W 36x5 W 36x5d* W 40x6d W 36x5 W 40x6d W 36x5 W	WWW	Vilson, G Vilson, H Vinther, 751 Vinther, 430 Vinther, 49 Vinther, 49 Vinther, 70 Vinther, 70 Vinther, 109 Vinther, 140	31 2 5 8 1 11 2 21 2 21 2 31 2 5 7	4300 5275 1795 2850 2450 3250 3690 4200 5250 5900 2750	41/2x5/2 43/4x6 31/2x5 33/4x5 4 x5 4 x5 4 x6 41/2x6 5 x6 33/4x5	36x5 36x6 34x41/21 32x4 34x31/2 34x4 34x5 36x5 36x6 36x6 36x31/2*	32x4 34x5 34x4d 36x6 36x5d 40x5d 40x7d 36x5*	W W I
White, 45 White, Hick., E White, Hick., H White Hick., K Wichita, K Wichita, L Wichita, M Wichita, R	5 1 11/2 21/2 1 11/2 2 21/2	5000 2450 2750 3350 2300 2600 2800 3000	414x534 334x5 334x5 418x514 334x514 334x514 334x514	36x6 402 34x5† 34x 36x3½ 362 36x4 362 36x3½ 362 36x3½ 362 36x3½ 362 36x4 362 3	5† W 5 W 5 W 4* W 5* W	Final Dr.	ic., Trive: —Doul —Ext	ternal	**Cana Vorm, I- eduction, Gear. ners solid	Idian n Interi B—Be *Tires-		WWW	/itt-Will, P /olverine, J /olverine, J /olverine, J /olverine, L /olverine, L ellow Cab M2 ellow Cab M4	21/2 1 11/2 2 21/2 31/2 34/4 11/4	3250 2240 2495 2750 3475 4150 2050 2350	384x5 41 8x514 41 2x512 384x5	36x3½° 34x3 34x3½ 34x4 36x5 36x5 32x4 34x4½	36x7* 34x4 34x5 34x7 36x10 36x10 32x4 34x4\2	W I I I B W

# Farm Tractor Specifications and Prices

					I CLI			actor	~]	100	U.		u el O i	10			CC						
TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinder s Bore, Stroke	Fuel	Plow	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow
All-In One Allis-ChalmB Allis-Chal.G.P	12-25 6-12 6-12	925 850	2 2	Weid. LeR. LeR.	4-3%x5½ 4-3½x4½ G 4-3½x4½	as. 1	1 -2	Gray1920 Ground Hog Gt. Western St	19-31	\$2000 1950	4	Wauk Erd. Beav.	4-4 <sup>3</sup> / <sub>4</sub> x6 <sup>3</sup> / <sub>4</sub> 4-4 x6 4-4 <sup>3</sup> / <sub>4</sub> x6	Gas. GorK K.	4 3 4	Post D Prairie Deg. L Prairie Deg. D	12-20 9-18 15-30	6.0	3	Wauk Wauk Wauk	4-414x534 4-334x514 4-412x614	Gas.	2 2 3
Allis-Chalm. Allis-Chalm. Allis-Chalm. Allwork. 2-G Allwork. C AndrewsKin.D. Appleton. 1921 Aultman-T. Aultman-T. Aultman-T.	12-20 18-30 10-18 14-28 14-28 18-36 12-20 3-5 15-30 22-45 30-60	1495 2150 875  2500 1500 550	4 4 4 4 4 4	Mid.W Own Own Own Clim. Buda Own Clim. Own	4-5 x6 G 4-5 x6½ G 4-4½x5½ G 1-4½x5 G 4-5 x6½ G 4-5½x8 G	ork 3, K ork ork 4, K 2. A&S. , K , K	4 3 3 4 1-3 1 4 6	Hart-Parr . 20 Hart-Parr . 30 Heider	15-30 9-16 12-20 6-10 20-30 12-25		4 4 4 4	Own Own Wauk Wauk LeR. Wauk Midw.	4-4\frac{1}{4}x5\frac{3}{4} 4-4\frac{1}{2}x6\frac{3}{4} 4-3\frac{1}{2}x4\frac{1}{2} 4-4\frac{1}{2}x6 4-4\frac{1}{2}x5\frac{3}{4}	K,D G,K G,K Gas. KorG	3 2 3 1 4 3 3	Ranger Cul. T-20 ReedA-1 Reisable Rex Russell. Russell. Russell.	8-16 15-30 18-36 10-20 12-25 12-24 15-30 20-35 30-60	2400 985 1600	4 4 4 4 4	LeR. Dom Dom Own Wauk Own Own Own	4-5 x6 2-6 x7 4-41/4x53/4 4-41/2x53/4 4-5 x61/2 4-51/2x7	K. Gas. Ker. GorK	1 3-4 4 2 3 2-3 4-1 8-10
Automat. B-3. Avery.SR.Cul Avery. Cult-C Avery. B Avery. C Avery. C Avery. Avery. Avery. Avery.	5-10 5-10 8-16 12-20 12-25 14-28		4 4 3 4 4 4 4 4 4	Herc'ls Own Own Own Own Own Own Own Own	4-4 x51 G 4-3 x4 G 6-3 x4 G 4-3 x4 G 6-3 x4 G 2-51/2x6 G 4-43/8x6 G 2-61/2x7 G	as. ,K ,K ,K ,K,D ,K,D ,K,D ,K,D ,K,D ,K,D	2 -3 -3 -3	Drive C Imperial . E Indiana F International . International N Klumb F	40-70 5-10 8-16 15-30 20-40	1000 1950	4 2 4 4	Clim. Own LeR. Own Own Clim.	4-5 x6½ 4-7½x9 4-3½x4½ 4-4½x5 4-5¼x8 4-4¾x6 4-5 x6½	G,K,D G,K,D G,K,D	10 1-2 2 4 3-4	Samson M Sandusky J Sandusky E Shawnee Com Shawnee Com Shelby C Shelby D Short Turn.	15-35 6-12 9-18 10-20	1750	4 4 2 2 4 4 3	Nov. Own Own LeR. Gray Erd. Beav.	4-43/x6	Gork G,K G,K	10 2- 3 3
Avery	18-36 25-50 45-65 15-25 18-25 15-25		4 4 4 *2 4 *2	Own Own Own Own Midw Midw	4-5½x6 4-6½x7 4-7¾x8 G 4-4¼x6 4-4½x5¼ 4-4½x5¼ G	K,D 4 H,D 5 K,D 8- er. as.	1-5 i-6 -10 3	LaCrosse M LaCrosse G Lauson 21 Lauson 21 Leader B Leader N Leader GU	12-24 12-25 15-25 15-30 12-18	1250 1495 1685 1985 1095 1985	4 4 4 4 4	Own Own Midw. Beav. Beav. Own Clim.	4-41/8x51/4 4-41/2x6 4-43/4x6 2-6 x61/4 4-5 x61/6	Gork Gork G,K,D G,K	1 3 3-4 3-4 2-3 3-4	Steady Pull. Stinson 4E Stone	12-24 18-36 20-40 15-27 10-20 2-6	1485 1835 2625 1000 385	4 4 4	Beav. Beav. Wisc. Own Vur.	4-4 x5 4-434x6 4-41/2x6 2-61/2x8 1-4 x4	Gas. G,K G,K Gas. G,K,D G,K	
Bates Mule G Bean. Beeman	8-16 2-4 30 60 15-30	340 1850 1650	*1 4 *2 *2 3 4	Midw Own Own Own Own Wauk Own	4-37 8x4 G 1-31/2x41/2 G 4-43/4x61/2 G 4-61/2x81/2 G 4-43/6x53/4 G 2-63/4x7 K	as. ,K,D ,K,D orK er. 3	-3 1/2 4 -9 2 -4	Liberty A Linn W Little Bear Little Giant. B Little Giant. A Lombard	18-32 60 4 16-22 26-35 85-150	2775 2530 2475 5600 850 2200 3300	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Clim. Buda Clim. Wauk. Ford Own	4-5 x6½ 4-5 x6¼ 4-3¾x4 4-4½x5 4-5½x6 6-5½x6¾	Gas. Gas. K. K. Gas.	3-4 3 4 6 16	Toro Cultivator Townsend Townsend Townsend Traction Motor Traylor Triumph	6-10 10-20 15-30 25-50 40-50 6-12 18-36	815 2450	3 2 2 2 4 4 4 2	Wauk LeR. Own Own Own LeR. Erd.	4-81/2x10 8-31/4x5 4-31/6x41/2 4-43/4x6	Ker Ker Ker Gas. Gas. Ker.	3 2 3 4 4
Capital Case Case Case Caterpillar T11 Caterpillar T16 Centaur Chase	15-30 10-18 15-27 22-40 25 40 5-2½ 12-25	1000 1090 1680 3100 495	4 4 4 *2 *2 2 3	Own Own Own Own Own Own N Way Buda	4-378x5 G 4-4½x6 G 4-5½x6¾ G 4-4¾x6 G 4-6½x7 G 2-4½x4½ G 4-4¼x5⅓ G	orK 4-as. as. or K 1-	2 3 1-5 4 6 1-9	Motor Macult. MagnetB Master Jr MerryGar1921 Minne . All-P Minne . Gen.P.	5-10 2 12-25		4	Own Wauk LeR. Evin Own Own	1-234x31½ 4-41½x614 -238x4 1-258x21½ 4-41½x7 4-434x7	Gas. K&G Gas.	3 1 3 3-4	Trundaar 10 Turner 1921 Twin City. Twin City. Twin City. Uncle Sam C20 Uncle Sam B19	14-25 12-20 20-35 40-65 12-20 20-30	1295 1385 2300	4 4 4 4 4 4	Wauk Buda Own Own Own Wid Beav.	4-5 x614 4-414x512 4-414x6 4-512x634 4-734x9 4-4 x512 4-434x6	G,K G,K G,K G,K G or K	4
Chicago 40 Cletrac W Dakota 4 Dart B.J. Depue A Dill D Dill R.W. De-it-All	12-20 15-27 15-30 20-30 20 20-	2480 2980	*2 3 4 4 4 4	Own Own Dom. Buda Cont. Midw.	4-4½x6 4-4 x5½ 4-4¾x6 4-4½x6 4-4½x6 4-4½x6 4-4½x6 4-4½x6 G	as. K,D 2 as. as. as. as.	3 3 4 4 3	Minne. Med.Duty Minne. HeavyDuty Mohawk 1921 Moline Univ D Moline Orch. Monarch B.	35-70 8-16	1075	2 2	Own Own Light Own Own	4-6x7 4-7½x9 4-3½x4½ 4-3½x5 4-3½x5	Gas. Gas.	5-6 8-9 1-2 2- 2-3 4	Uncle Sam D21 Universal. Utilitor501 VelieBiltwel Victory1921 Victory1921	1-4 21/6-4 12-24 9-18 15-30	475 380 1750 1350 1750	2 4 4 4 4 4	Beav. Own Own Own Gray. Wauk Wauk	1-3½x5 1-3½x4½ 4-4½x5½ 4-3½x5 4-4¼x5¾	G,K,I Gas. Gas.	5
Eagle F Eagle F E-B AA E-B Q E-B	4-6 12-22 16-30 12-20 12-20 16-32 18-30		4 4 4 4 4	Own Own Own Own Own Own Buda	2-7 x8 G 2-8 x8 G 4-434x5 G 4-434x5 G 4-514x7 G	orK 4 orK orK orK	3-4 1-5 4 3	Motox	15-30 3-6 3-6	2250 425 425	4 4 4	Beav. Buda Own Own	4-41/2x6 2-31/4x4 2-23/4x4 8 x10	G or K Gas. Gas. Gas. GorK	3-4 34 34 3-6	Wallis K Waterloo N Webfoot 44 Webfoot 5 Wellington F	15-25 12-25 25-40 28-53 12-22	1600 4000 5250 1600	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Own Own	4-4%x534 4-414x534 2-61/2x7 4-53/4x7 4-4 x6 4-43/4x6		2
Fageol D Farm Horse. Farquhar Farquhar Farquhar Fitch 4 Flour City	9-12 18-30 15-25 18-35 25-50 20-35	1528	5 4	Lye. Clim. Buda Own Own Clim.	4-3½x5 G 4-5 x6½ G 4-4½x6 G 4-6 x8 G 4-7 x8 G 4-5 x6½ G	as. ,K,D 3 ,K,D 4 ,K,D 6 orK 3	2 3-4 3-4 4-5 6-7 3-4	Nilson Jr E Nilson Senior Oil Pull K Oil Pull H Oil Pull G	15-25 20-40 12-20 16-30	2675 1485 2285 3175	4 5 4 4 4	Own Wauk Wauk Own Own	2-6 x8 2-7 x8½ 2-8 x10	K,D K,D K,D	4-7 3 4 3-6 5-6	Western. 1920 Wetmore. Wharton. I Whitney. Wichita. 1 Wisconsin. I Wisconsin. I	16-32 12-25 12-20 9-18 15-30 16-30	2100 1650 1800 1175 2500	4 4 3 4	Clim. Wauk Buda Own Bear. Clim. Clim.	4-5x6½ 4-4 x5¾ 4-4¼ x5½ 2-5½x6½ 4-4½x6 4-5 x6½	Gas. G,K Gas. Gas. G,K,E	3-43
Flour City Flour City Flour City Fordson Fox Franklin Granklin G 2	1 18-36	623 1300 4000 3350	0 4 0 *2 0 *2	Own Own Own Own Clim. Clim.	4-634x7 K 4-71/2x9 K 4-4x5 G 4-51/2x71/2 G 4-5 x61/2 G	er. 6 er. 8 K or K or K	4-6 6-8 8-1 2 4 3-3 3-4	Oldsmar Gark Oliver A Once Over Til- ler Mark 6	2½-5 15-30 12-25	395	4 *2 4	Own Own Beav. Strns	2-10x12 1-51/xx51/2 4-41/2x6 4-41/2x6 4-41/2x6	Gas.	8-10 2/3 3-4 2	ZelleABBREVIA	25-40 12-25	4892	-Gase	Wise. Wise.	4-414x51/2	e. D-	Dis
Franklin . G 2 Frick	1 19-96	4350	0 2 4 4	Clim. Erd. Beav.	4-5 x61/2 C	or K	3-4 2-3 3-4	Peoria I Pioneer G	12-23 18-36	1785	4	Clim. Own Own LeRoi	4-5 x61/2	G,K G,K,D Gas.	3 4 10	tillate. Plow Figures are ba Beav.—Beave Northway. W City. Vur.—V	sed on 1 r. Don auk.—	4-in. p	olows. oman. esha.	LeR- Cont. Wisc	LeRoi. Cli —Continent Wisconsin.	m.—Cl al. N T.C.—	or Twi

Fulton ... 10-20 1275 3 Wauk 4-43/x55/3 Gork 18-36 12150 4 Wauk 4-43/x59/4 Gork 4 Per Huron A 12-25 1700 4 Chief 4-43/x66 G,K 3 Wauk 4-43/x59/4 Gork 18-36 12150 4 Wauk 4-43/x59/4 Gork 18-36 1

# COMING MOTOR EVENTS

**AUTOMOBILE SHOWS** 

	THE THE PLANT BLICKS	
Memphis	Used Car Show	.May 23-June 2
Cincinnati	Fall Automobile Show	Oct. 1-8
New York	Automobile Salon	.Nov. 27-Dec. 3
Chicago	Automobile Salon	January-1922
	RACES	
Indianapolis Speedway.	500 Mile Race	May 30
Reno	First Annual Nevada Highway Road Race	1000 miles
Uniontown Speedway	Speedway Events	June 18
Cincinnati	Speedway Race (Possible)	July 4
Tacoma	Speedway Race	Iuly 4
La Mans	French Grand Prix	Iuly 25
Elgin	Road Race (Possible)	August 3
Pikes Peak	Hill Climb	Santamber 5
Uniontown Speedway	Annual Autumn Classic	September 5
Los Angeles	Speedway Race	November 24
	FOREIGN SHOWS	
D	Czecho-Slovak International Exposition	** **
Prague	Czecno-Slovak International Exposition	May 28, 1921
Basie, Switzerland	International Automobile Exhibition	May 28, June 8
Reykjavik, Iceland	Agricultural Machinery	June, 1921
Buenos Aires, Argentin	na Passenger Cars and Equipment	September
Luxemburg	Luxemburg Agricultural Sample Exhibition	nSeptember
Paris, France	Paris Motor Show	Oct 5-16
London	British Motor Show, Society Motor Mfrs	. and
	Traders	AT 4 10

	7-16
	CONVENTIONS
West Bade	en, IndSummer Meeting Society of Automotive Engi-
	neersMay 24-28
Greenville,	S. CSouth Carolina Automotive Trade AssociationJuly 20
Mackinac	Island, MichSummer Meeting Automotive Equipment Associa-
Chicago	Twenty-eighth Annual Convention National Imple-
Cleveland	ment & Vehicle AssociationOct. 12-14National Tire Dealers' AssociationNovember

Traders

### **Business Notes**

The Stevenson Gear Company of Detroit, Inc., with a capital of \$3,600,000, will begin work this month on a factory to cost \$1,500,000 and to employ about 500 men. The company is headed by Richard T. Wingo, president, and other officers are Frank C. Sibley, secretary, G. W. J. Linton, treasurer, G. E. Stevenson, inventor of the product the company manufactures, and who is secretary of the Stevenson Gear Co. of Indiana, the parent corporation, and E. B. Johns, treasurer of the Indiana company, also are members of the board of directors with the officers. The company will manufacture gears on special machines, the invention of Stevenson, and expects to be in production in the Fall. The Stevenson gear company of Indiana located at Indianapolis, now has a \$10,000,000 company in operation in that city.

The Toledo Automotive Products Co. has taken an exclusive license for the manufacture and sale of the Dorr Miller differential. Among the officials and stockholders are G. Huette and R. W. Randall, formerly of the Falls Motor Works; A. R. Class, president of the Toledo Steel Products Co.; C. E. Thompson and J. A. Krider, of the Cleveland Steel Products Co.; G. S. Salzman, of the H. J. Walker Co.; R. M. Bean, of the Durston Gear Corp.; D. A. Shaw, president of the Grant Motor Car Corp., and R. J. Goldie, of the Columbia Axle Co. It is henintention of this organization to push the manufacture of the Dorr Miller differential and place it immediately upon a production basis.

The American Gear Manufacturers Association elected the following officers at its fifth annual convention held at Cincinnati: F. W. Sinram, president (re-elected); R. P. Johnson, first vice-president; F. D. Hamlin, secretary-treasurer (re-elected). The work of the association is the standardization of the various products of the gear industry.

Hartford Automotive Parts Co. affairs are being conducted by R. E. Carpenter, president of the company, and Cyrus C. Chamberlain of Southington, Conn., as temporary receivers appointed in a friendly receiversh

The Motor Wheel Corp., Lansing, has appointed H. H. Crawford, 6553 Woodward Avenue, Detroit, as special representative for the Gier Tuarc steel disc wheel in the territory of Michigan, Illinois, Indiana, Wisconsin and Ohio.

# An Automobile Race in the Early Days of Motordom

Nov. 4-12



Above is shown the lineup for one of the first automobile races. This picture was snapped in Washington Park, Chicago, Nov. 28, 1895. Many of the "red devils," so called and often so painted, were rated very high in horsepower, while in fact most of them had to allow the car to race down a hill to get power to get up the other, and one could risk getting up a hill only with a good start and then using the low gears finally. Following are some of the facts relating to this historic event.

Distance—54 miles.

Prize-\$5,000, offered by the Record-Herald.

Entries-About 90.

Starters-6.

Winner-The Duryea.

Speed-An average of 71/2 miles per hour.

Weight of Car-700 lb.

Wheels-Buggy type with solid rubber tires.

Motor-Air cooled, single cylinder.

Horsepower-31/2.

Transmission-Leather shifting belts.

Entries-Electric, gasoline and steam.

Judges-Henry Timkin, president, Carriage Builders National Association.

> General Merritt of the U.S. Army.

Prof. Barrett of the electric department, Chicago.